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NEW SERIES—VOLUME 46, PART 4
1956

KLAMATH PREHISTORY

The Prehistory of the Culture of the Klamath Lake Area, Oregon

L. S. CRESSMAN
University of Oregon

With Appendices by

WILLIAM G. HAAG
Louisiana State University

and

WILLIAM S. LAUGHLIN
University of Wisconsin

THE AMERICAN PHILOSOPHICAL SOCIETY
INDEPENDENCE SQUARE
PHILADELPHIA 6

NOVEMBER, 1956

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PREFACE

It has been a long time from the beginning of the field work on this problem until the completion of the report for publication. Field work was carried out from 1947 through 1951 with the exception of 1950 when the writer was on leave and spent most of the time, with the exception of three months in Mexico, working on the analysis of the results of the work until that time. The heavy responsibility of administrative duties in addition to teaching and carrying on our research program following my return to academic duties in September, 1950, made it almost impossible to get any time for consecutive writing except Saturdays and so-called vacations. In 1951 we had initiated a survey of the Oregon Coast as a part of our long range research program to provide a basis for intensive work in that important area. Then in 1952 the University of Oregon was asked by the National Park Service to cooperate in salvage work in the reservoir area of The Dalles dam on the Columbia River. It was imperative that this work be carried out as rapidly as possible. We were, therefore, forced to postpone further work along the Oregon Coast and concentrate on the Columbia River project. Six weeks in 1953 and ten in 1954 were devoted to excavations east of The Dalles, Oregon. The preparation of the monograph on the Klamath problem had to be fitted in as best it could in view of the emergency situation at The Dalles. However, progress, even if slow, was made. It may be fortunate in hindsight that the completion of the Klamath study was delayed in view of the implications of the work on the Columbia River, some of which are referred to in the text.

At any rate if there are places in this study where there seems to be lack of smooth continuity the explanation offered above may serve somewhat as an *apologia,* even though it does not eliminate the defects if they do exist.

As a matter of policy I have at times introduced certain subjects of discussion even though the subject is discussed at length later in the study. This has not been due to carelessness but is used as a device to tie the whole study into a compact whole. In case this technique is viewed as repetitiousness it should be considered in the light in which it was intended. It was felt that such references, anticipatory it is true, would give greater significance to the subject under discussion in the overall problem.

There are no photographs of the house pits dug into the Kawumkan Springs Midden. This is due to one of those unfortunate accidents which sometimes occur. A box containing the exposed but undeveloped negatives fell in handling and the negatives made a disgusting pile on the ground. They were thrown into the camp fire.

The work has been financed by grants from the American Philosophical Society, the Wenner-Gren Foundation for Anthropological Research, the Social Science Research Council and the Research Council of the University of Oregon. To these foundations and organizations I express my deep appreciation and obligation.

To the John Simon Guggenheim Memorial Foundation I am deeply indebted for the renewal of an earlier appointment as a Fellow in 1949–1950. This enabled me to take sabbatical leave that year and to analyze our collections and reflect on the problems involved in the research project. In addition, a three months period of work in Mexico was made possible during which studies of museum collections and monuments helped immeasurably to gain an intellectual perspective for some of the problems of the simpler cultural manifestations with which I was concerned.

No field archaeologist who depends on student assistance, with the students usually paying for the privilege of working, can adequately express his thanks to them. Certainly without them the work would not get done. Over the years there were too many in the field parties to mention them all by name. The parties consisted of both men and women students and neither group was superior to the other. Some have the satisfaction of having received training which has helped them in going on to professional careers. Others have the satisfaction of having known fine comradeship and interesting, if hard and dirty, work directed toward the solution of important problems. My thanks to all of them.

Most of the photography of the excavations of the Kawumkan Springs Midden was done by Mr. David L. Cole, a student member of the party. The drawings and drafting were done by Mrs. Allen Merewether (née Helen McGillicudy) who was a member of the field parties in 1948, '49, and '51.

It will be noticed that both line graphs and bar charts have been used to present the change in incidence of artifacts and other data. The bar charts which show the deviation from the average as either plus or minus are used as an effective device for visual presentation and imply nothing about any supposedly involved statistical device by which the original data are derived. The average percentage in the respective situation is taken as a reference point and then the measure under consideration is recorded as being greater than, less than, or equal to that value by the number of points concerned.

The bibliography includes all the books from which quotations have been made but not all the sources which have been consulted. Some references are included which have been consulted and which have been productive of ideas but from which no quotations have been made. One of the most important sources of stimulation to any student is discussion with his col-

leagues and from these he gets many ideas. Sometimes he remembers the source and is gracious enough to acknowledge it but over the years these contacts are part of one's intellectual growth and use is made of ideas as such or the ideas have stimulated the production of new ones in the person's mind. He has lost all track of origins. To these contacts one is always in debt.

Appreciation is expressed to Mr. and Mrs. Henry Wolff, Mr. and Mrs. Gerald Wolff, Mr. and Mrs. Roy Gienger, Mr. and Mrs. F. F. McCready, Mr. and Mrs. Earl Harris for permission to camp and work on their ranches and many courtesies extended to us. To Mr. Roland Lalo and Mr. Leonard Long we are indebted for permission to work the Kawumkan Springs Midden. Thanks are also due to Mr. Gentry, Mr. McQuiston, and Mr. Merritt. To the Klamath Indians as a group and many individuals we are indebted.

My wife, Dorothy Cecilia, has always helped with her sympathetic understanding and interest in the work. She has never complained at being a "field man's widow" as each year took us into the field for the better part of the summer. I hope that this study is some reasonable reward.

L. S. C.

Eugene, Oregon,
February 15, 1955.

KLAMATH PREHISTORY

The Prehistory of the Culture of the Klamath Lake Area, Oregon

L. S. CRESSMAN

CONTENTS

	PAGE
I. Introduction	377
II. The Klamath Indian Habitat	384
III. The Klamath Culture	387
IV. Medicine Rock Cave	398
V. Kawumkan Springs Midden	403
VI. Klamath House Types: The Archaeological Record	433
VII. Artifacts from the House Pits	446
VIII. The Food Economy and Ecological Adaptation of the Midden Population as Implied by the Food Habits	448
IX. Dog Burials	455
X. Human Skeletal Remains	457
XI. The Chronology of the Cultural Development of the Klamath Area	459
XII. The Relation of the Klamath Lake Area Culture to that of the Great Basin	465
XIII. Summary and Conclusions	468
Appendices	
A. Artifact Inventory from House Pits	471
B. Prehistoric Dogs from Klamath Indian Reservation. By William G. Haag	472
C. Human Skeletal Material from Kawumkan Springs Midden. By William S. Laughlin	475
D. Identification of Bird and Fish Bones from Kawumkan Springs Midden	480
Bibliography	482
Index	510

I. INTRODUCTION

THE PROBLEM

This paper is concerned with the prehistory of the Klamath Indians or to be somewhat more precise, the prehistory of the culture of the area now occupied by the Klamath in south central Oregon, and the relation of this culture to that of the Great Basin. As this study progressed it became quite clear that the problem was more than a simple one in historical reconstruction. On the contrary, the record showed a process of the progressive adaptation of a culture to an ecological situation and a divergence in development from an early basic and widespread type to that characteristic of the Klamath Lake region at the time of white contact. Thus, it also became a study in cultural-ecological adaptation. Since we are concerned here with a study in time, it will be useful to summarize briefly what is known at the present time about the changes of post-Pleistocene or Neothermal climate in the Great Basin and relate the Klamath picture to those data as it affects the application of theoretical analysis and the interpretation of data.

Before proceeding further with the discussion, a brief explanation of the terms used to define the subdivisions of post-Pleistocene time is in order.

TERMINOLOGY

Students of subjects involving post-Pleistocene geochronology, especially in the western United States, have lacked an adequate terminology to describe the subdivisions of this period. The use of Early, Middle, and Late post-Pluvial as a terminology recognized the three established subdivisions of the larger period but the words had no descriptive value. It was well recognized that the periods differed in temperature and moisture. Archaeologists working with problems of cultural development in the arid west and particularly the Great Basin were aware of the possibility of interrelationship between climate and culture but were faced with a difficulty in exposition since the nomenclature of the different climatic periods failed to designate the significant characteristics which might in turn affect the culture.

Therefore, when Dr. Ernst Antevs, who has worked closely with the archaeologists in the problems of the arid west, suggested a new series of names which adequately described the significant characteristics of the subdivisions of the post-Pleistocene, the terminology was quickly accepted by most archaeologists and has come into widespread use and acceptance. This terminology has the value of being adequately descriptive and concise and its use makes unnecessary a considerable amount of unsatisfactory verbal maneuvering that would otherwise be unavoidable. Antevs (1948: 8–9) published the proposed terminology and the reason for advancing it. He writes as follows:

> The distinctive age of the last 9000 years has no universally accepted name. The term "Postglacial" (or "Postpluvial" in regions), which is rather generally used in Europe, does not appeal to American geologists who prefer to employ "postglacial," not as a term, but as an elastic word to designate the age, deposits, events, and conditions since the local or regional departure of the last ice sheet, whether this occurred 40,000 or 10,000 years ago. The terms "Recent" and "Post-Pleistocene," used with little enthusiasm in America, are inappropriate. The word "recent" means "modern" in Scandinavian languages; and the age in consideration is properly a part of the Pleistocene, not a successor. "Holocene" has been tried both in Europe and America. Here is therefore suggested the term *"Neothermal," adj.* and *n.*, from "neo-" meaning "new," "recent," and from "thermal," meaning "of or pertaining to heat." "Neo-" is included to distinguish this late warm age from the interglacials which would be more appropriately named warm or thermal ages. In a classification scheme the Neothermal age should have the same rank as the Wisconsin

TABLE—THE NEOTHERMAL (POSTGLACIAL OR POSTPLUVIAL)

	General temperature ages	Moisture conditions in Great Basin and contiguous areas
Present		
	Medithermal Moderately warm	Arid and semiarid: Rebirth of lakes and glaciers; Summer Lake maximum 45 feet above average modern stand
2500 B.C.		
	Altithermal Distinctly warmer than at present	Arid: Disappearance of lakes and glaciers; Summer basin dry
5000 B.C.		
	Anathermal At first as today, but growing warmer	Probably subhumid and semiarid: Lake in Summer basin at least 90 feet higher than modern lake
7000 B.C.		

Glacial and the Sangamon Interglacial (Sangamon Thermal).

In the accompanying table related terms are suggested for the general postglacial temperature ages, discussed above to supersede the terms Early, Middle, and Late Postglacial and Postpluvial. The prefix "ana-" means "upward"; "alti-," "high"; and "medi-" means "of intermediate degree." Moisture conditions are too regional to be used as basis for a general time division. Those given in the table apply only to the Great Basin and some contiguous areas.

Dr. Antevs' suggested terminology is used in this study.

ENVIRONMENTAL BACKGROUND

The Great Basin lies roughly between the Rocky Mountains on the east and the Cascade-Sierras on the west and begins in the north at a line running approximately east to west across central Oregon extending southward to pinch out as the drainage of the Colorado River moves west and south. This area, certainly for the most part, was in the post-Pleistocene, a region of interior drainage. It is this drainage pattern together with the physiographic features which sets the region off from the surrounding areas. The conspicuous land features of the Great Basin are (1) a generally high elevation ranging from 1,000 m. to over 2,000 m., (2) a series of mountains and high tablelands running north and south with occasional peaks reaching to approximately 3,000 m., and (3) a series of basins, some of which are the result of faulting while others are probably synclinal valleys, lying between the high tablelands which served as catchment basins for precipitation.

With the advance of the ice sheets during the Pleistocene, the storm paths of the north Pacific cyclones were pushed southward to about the latitude they now reach during the winter months but instead of moving north in the summer they remained at this point throughout the year. Consequently, with the increased annual precipitation and the somewhat colder temperatures, the local glaciers on the mountains built up faster than they melted. There was a higher precipitation in the intermontane region than at present. Therefore, these catchment basins in the Great Basin came to hold lakes. The increased precipitation, the raising of the water table generally, and the run-off from the mountain glaciers all were sources of the water supplies for these lakes. Since these lakes had no outlet to the sea and received their water supply directly or indirectly only from precipitation, they would lose their water because of decrease of precipitation and by evaporation. When loss through evaporation exceeded the supply then the lakes would decline in size and if the loss eventually exceeded the supply they would dry up entirely. These times of greater moisture, correlated with the glacial periods, are the Pluvial periods and the lakes which arose as a result of the pluvial conditions are called Pluvial lakes. In the Great Basin the two largest Pluvial lakes were Lake Bonneville, of which Great Salt Lake is now a remnant, and Lake Lahontan in Northern Nevada, of which now only Pyramid Lake remains. In addition to these bodies of water there were many others, some of great size. South central and southeastern Oregon was marked by a series of these lakes. (Cressman, 1942; Hubbs and Miller, 1948; Meinzer, 1922.)

During the great climatic changes of the Neothermal these lakes went through a process of gradual desiccation during the Anathermal to become dry beds subject to deflation during the Altithermal, and then to re-form with the Medithermal on a much smaller scale than during the Pluvial periods, with a final readjustment to their present conditions about 2,000 years ago. If we date the beginning of the Neothermal, that is, when the post-Pluvial climate became much like that of today, from about 10,000 years B. P. (Before the Present) (Antevs 1953*b*, chart 1), then, since documented evidence exists for the presence of man in the Great Basin throughout most of this period, his occupation of the region clearly must be studied against the great cyclical climatic changes so characteristic of it.

Antevs (1953*a*, *b*) provides for a period of deglaciation marked by slightly rising temperatures during the Mankato-Valders retreat of the ice dating from the Des Moines maximum. There were during this time periods of oscillation, the last of which was the Cochrane advance. Antevs dates the Des Moines maximum at 19,000 and the beginning of the Neothermal, that is the ice retreat after the Cochrane advance and the establishment of climate, especially temperature, at the present

norm, at about 9,000 to 10,000 years ago. The estimated dates for the Mankato-Valders advance of Antevs' are considerably earlier than those indicated by the series of radiocarbon dates published by Libby. If the climate at 9,000 years ago corresponded to that of the present, then it is clear that the country could have been occupied before that time when conditions were ameliorating.

When we try to put the Klamath Lake basin into this environmental frame of reference we immediately are faced with certain difficulties. It has been explained above that many of the Great Basin lakes were formed in structural troughs having had no outlets to the sea. Klamath Lake [1] lies in a fault basin with its eastern boundary formed by the great escarpment which extends for over 40 miles in an almost unbroken line. Structurally it is part of the great complex of faults extending across southern Oregon from the Cascade range which forms the western shore line of the lake. However, it differs from the other lakes in three important respects: (1) it has an outlet to the Pacific Ocean, the Klamath River, which cuts through the Cascade range at Keno in northern California, (2) it receives its supply of water from perennially flowing streams and rivers, and (3) as a result of the situation mentioned in (2) it has remained almost constant in size. Its outlet to the sea, as far as the human occupation of the area went, was important for two reasons: one, that it provided a source of food in the fish which ran from the sea, and two, it provided a line of contact with the coastal area for the bidirectional movement of population.

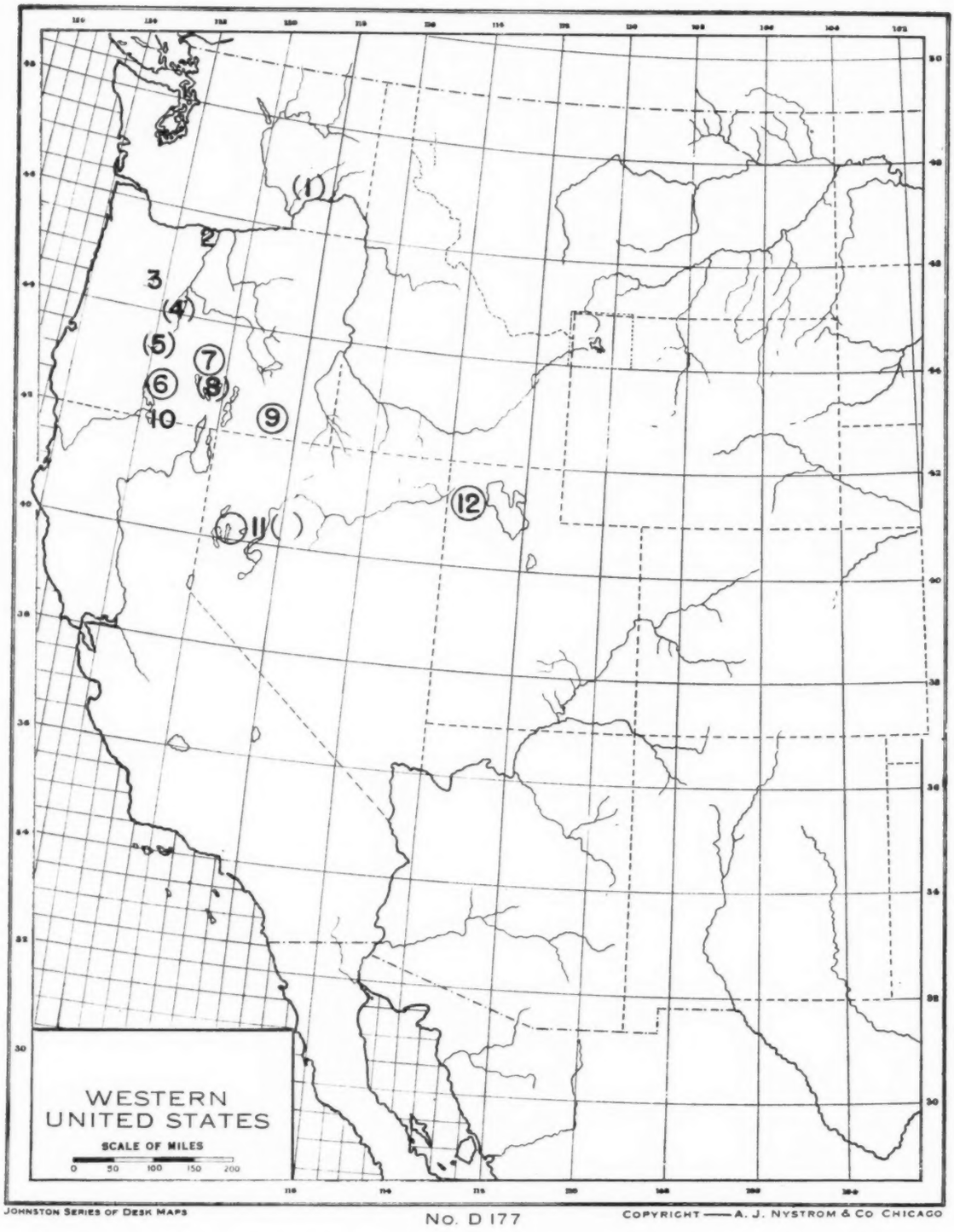
An examination of a map of the Northern Great Basin will show that the drainage basin of the Klamath area projects like a great square into the typical Great Basin environment. On the west was the Cascade range. The climatic picture as reflected by temperature and rainfall, the ecological picture as rounded out by the fauna and flora, show that the Klamath region in spite of the drainage pattern of the lake should be classed with adjoining area of the Great Basin. The details of the environmental picture of the Klamath Lake region will be discussed later.

Archaeological research in the Northern Great Basin as of 1947 had shown that man occupied the area shortly after the termination of the Pluvial period. Various sites had recorded man's presence at different times from the earliest period to the coming of the white man. *Cf.* map 1 for sites as of 1954. No single site, however, had given any continuous record of occupation throughout the entire period. In order to secure a culture continuum it was desirable to find and excavate a site which had a record of continuous use throughout the entire time of man's occupancy in the Great Basin. A number of adjacent and related sites overlapping in time would also give the desired results. A series of cave sites and lake bed localities had furnished a fairly complete picture of the adaptation to the environmental conditions and the climatic variations characteristic of the post-Pleistocene Great Basin climatic history. Briefly, the picture showed a series of populations with a hunting and gathering economy pretty well adapted to a lake shore and tableland environment, the characteristic physiographic features of the Great Basin. Birds, mammals, both large and small, seeds, roots, and probably berries made up the food supply of the people. Fish did not seem to enter into the economy although mollusca perhaps occasionally did. Sagebrush bark, tule, *Xerophyllum,* provided the materials for sandals, basketry, and possibly other articles of costume. Ecological areas changed abruptly from the lake floors up the sides of the land masses that separated basin from basin. Most of the ground water supply was to be found in the lakes and the springs along the fault scarps or in the few streams which flowed into the lakes. The lakes for the most part were otherwise dependent for their water supply on the conditions of precipitation and temperature. Since the basins had no outlets, water was lost by evaporation. Therefore, while the lakes were excellent climatic indicators, because of the scarcity of water from other sources both man and the animals which served him as food were to a great extent dependent on the continuity of the lakes for survival. The available evidence had shown that man lived along the shorelines of these old lakes and only occasionally along the rivers. At least no evidence so far found showed any occupation site of any consequence at any distance up any creek or river from where it enters the lake basin. Man was thus largely dependent on the life of the lakes to which he made his adjustment.

Since this work on the Klamath reservation was undertaken in 1947 further work has been carried out in the Great Basin by Jennings at Danger Cave, near Wendover, Utah (Jennings, 1953), and by Heizer at the Leonard Rock Shelter, near Lovelock, Nevada.

The earlier estimates of dates for sites for Oregon published by Cressman (1942) had indicated occupation of the Northern Great Basin at certain favorable sites during the dry Altithermal, although the date for the Mount Mazama eruption, which was the reference point, was uncertain. Williams had indicated that the eruption was probably between 4,000 and 10,000 years ago and more likely nearer the former than the later date. A series of dates based on Carbon 14 determina-

[1] We shall use the term Klamath Lake throughout. On the maps are shown Agency Lake at the extreme north end connected by a strait with Upper Klamath Lake, and a Lower Klamath Lake about 25 miles south of Klamath Falls lying partly in Oregon and partly in California. Lower Klamath Lake does not enter this picture. It was in part a symbiotic adjunct to the outlet of Upper Klamath Lake and in part a Basin type of lake which had its level determined in part from precipitation (Cressman, 1942). By Klamath Lake we shall refer to the body of water referred to on the maps as Agency Lake and Upper Klamath Lake.

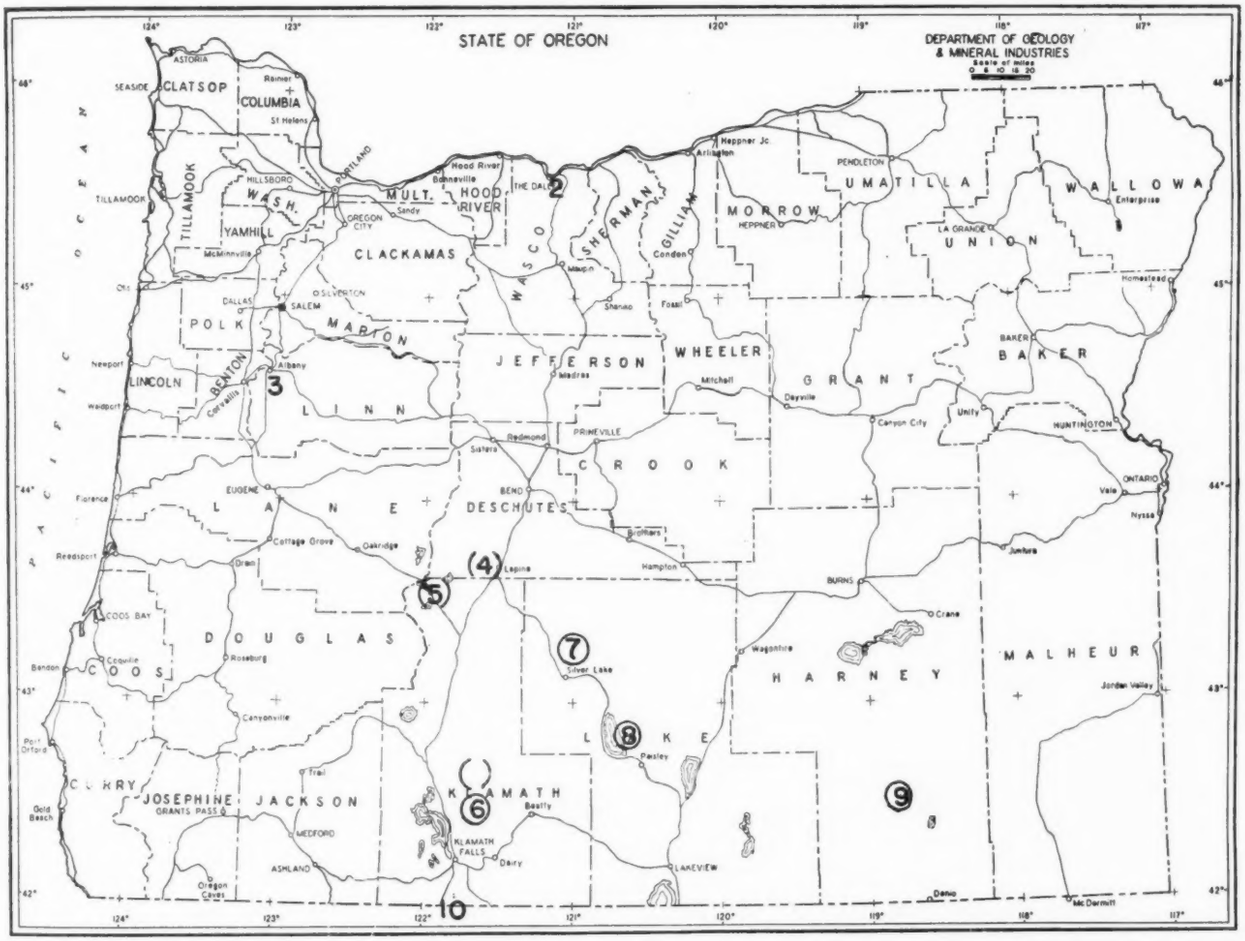


MAP 1. Archaeological sites in the Northern Great Basin and its northern periphery referred to in text. (1) Lind Coulee; (2) WS-4, Columbia River; (3) Willamette Valley; (4) Wikiup; (5) Odell Lake; (6) Klamath Lake area; (7) Fort Rock; (8) Paisley Caves; (9) Catlow Valley Caves; (10) Lower Klamath Lake; (11) Lovelock region; (12) Danger Cave. ○ indicates C-14 date from artifact, ( ) from non-artifact. *Cf.* Chart 3. Map reproduced by permission of the publishers.

tion (Cressman, 1951) from Oregon, Danger Cave, and Leonard Rock Shelter has shown that the Great Basin was occupied during the dry Altithermal. It is quite likely that the occupation was spotty and limited to small bands who could subsist on the reduced food and water supply, but at any rate human occupation did not cease. Since occupation continued during the Altithermal, then with the improvement of the climatic conditions of the Medithermal, not only could the small bands increase in numbers but other population units could move into the area.

Antevs in a series of papers has clearly defined the climatic history of the Great Basin. Cressman has added critical details to the picture for the Oregon area. These studies clearly indicated that if a culture continuum were to be found it would require an environment where there had been little change since the end of Pluvial; or to put it another way, where the environment had been sufficiently constant, so that the population adjusted to the early post-Pluvial or Anathermal environment could carry on its existence because both the water supply and the food supply remained on the whole relatively constant. Not that the same animals and plants remained but that enough of each remained that with reasonable adaptation a population could continue its life in that area.

With this conceptual basis the situation was examined to determine where, if anywhere, in the Northern Great Basin the desired environmental area was to be found. The Klamath Lake basin lying against the eastern slopes of the Cascade Range suggested itself as a possible area. The lake was in existence as a contemporary of the typical pluvial lakes to the east. It was a fault basin lake but it had three characteristics that differentiated it from the pluvial lakes. One, it was a product of perennially flowing rivers and springs. Two, it had an outlet to the Pacific Ocean by the Klamath River. Three, as shown by the terraces with a maximum elevation of 6 to 8 feet above the present lake surface, the level had fluctuated little as compared with the other



MAP 2. Archaeological sites in Oregon referred to in text. (2) WS-4, Columbia River; (3) Willamette Valley; (4) Wikiup; (5) Odell Lake; (6) Klamath Lake area; (7) Fort Rock; (8) Paisley Caves; (9) Catlow Caves; (10) Lower Klamath Lake. O indicates C-14 date from artifact, ( ) from non-artifact. *Cf.* Chart 3.

lakes which had fluctuated from well over a hundred feet to nothing. There was thus a continuity of water supply.

THE KLAMATH LAKE REGION IN RELATION TO THE GREAT BASIN

With the complex of lakes, rivers, and springs there was no reason to believe that there had been much change in the ecology of the area during the post-Pleistocene except for the major fact of the extinction of the great Pleistocene fauna. Of these the three most important were the elephant, the camel, and the horse. The modern fauna represents not a newly developed series, but one of categories lacking certain of the late Pleistocene types and probably is a continuation of types already in existence in the Pleistocene. The animals providing the food supply which ranged over a wider area in more favorable times continued with little diminution in the Klamath area. As a matter of fact, the food supply in the Klamath Lake area was enriched by the fish to be taken from the lake and the rivers flowing into it. The landlocked lakes of the eastern area were in the main lacking in fish except for some small survivors of types to be found in the earlier drainage systems. (Hubbs and Miller, 1948.)

To the north on the Deschutes River, to the east and northeast in the Summer Lake and the Fort Rock-Fossil Lake basin, and to the south in the basin of Lower Klamath Lake, evidence of Early Man had been found (map 2). If he had lived around the Klamath Lake region on all sides except in the mountains to the west and perhaps there, too, there was every reason to believe that he was also to be found in the Klamath Lake region. If his occupancy of the region to the east had been dependent on the climatic fluctuations and the changing character of the lakes there, then had he been in the Klamath Lake region in the early post-Pleistocene, as far as the environment were concerned, there was every reason to expect a continuity of occupation of the area.

THE PROBLEM OF THE CULTURE POSITION OF THE KLAMATH INDIANS IN PREHISTORIC TIMES

The Klamath Indians occupied the Klamath Lake area in historic times. They have no traditions of migration from elsewhere. As far as all the evidence goes they have been there throughout their history. Basically the Klamath culture shows an adaptation to a marsh and riverine environment. Ceremonial practices involve elements of costume made from shredded sage brush bark which strongly suggest the old habits and certainly are generally foreign to later costume uses. Spier (1930: 207–210) describes the shamanistic performances with the use of sage brush costume strongly suggesting a ceremonial survival. The description of the Klamath culture by Spier in his classic monograph (1930) gives a cross section picture but not one in depth. Cressman (1942: 140) suggested a possible relation of the Klamath culture to that of the old lake basins as carrying a kind of fossil core of the old lake adaptations.

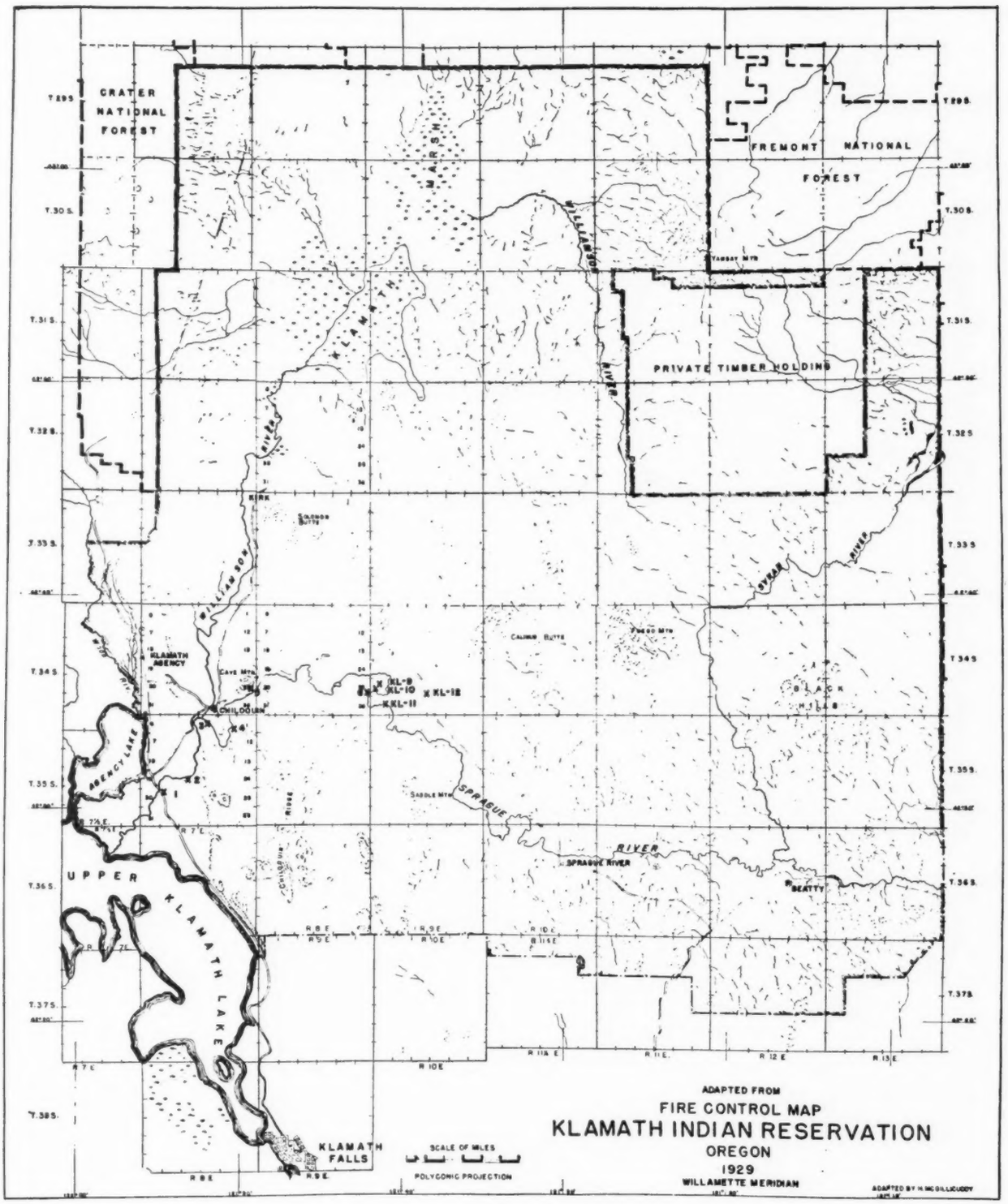
Since the Klamath continued to occupy their villages until the establishment of the reservation in 1866[2] there was an excellent opportunity to validate the hypotheses of a culture continuum in the Klamath Lake area by starting with known sites and working back into the unknown. Therefore, in 1947 the University of Oregon initiated a program of research in the archaeology of the Klamath Lake area on the Prehistory of the Klamath Culture, to validate the hypothesis of continuity of the occupation of the Klamath Lake area from the early period of post-Pluvial occupation in the Northern Great Basin to historic times, and to secure a cultural continuum, if possible, throughout post-Pleistocene time.

EXCAVATION AND METHODS

Work was begun with the villages on the Williamson and Sprague rivers known to have been occupied at the time of white contact. Then a cave on the Sprague River was found which had a long period of occupation and work was carried on in this concurrently. The season of 1948 was devoted to excavation of house pits at Kawumkan Springs farther up the Sprague and completion of the cave (Medicine Rock Cave). The season of 1949 was entirely devoted to the excavation of a deep and extensive midden at Kawumkan Springs, into which it was discovered the house pits upon which we worked in 1948 had been dug. No work was carried out in 1950. In 1951 excavations were carried out in one very large house pit, in two small middens and incorporated house pits. The 1951 excavations were an attempt to secure materials that would overlap the terminal occupation of the Kawumkan Spring Midden and the later period characterized by the regular use of pit house dwellings. Map 3 shows the site locations.

The work on the house pits was primarily concerned with determination of the type of structure and if any change was apparent in time. Spier's (1930) descriptions gave a good starting point. Artifacts secured from the house pits helped to establish a relative time sequence both for villages and pre-white and post-white contact life. The method generally used in house pit excavations was to establish the floor level in the center and the fire-pit. Then trenches were run across the pits at right angles and extended beyond the lip formed by the side dirt and refuse. Then the pit was excavated section by section until the entire depression was cleared. A few pits were only trenched to determine the floor profile and house post patterns. The house pits excavated in 1951 were dug on a grid pat-

[2] The treaty with the Klamath Indians was signed in 1864. Applegate, the first agent, took office in 1865 and the agency was established in 1866.



MAP 3. Klamath Indian reservation and site locations. (1) Williamson River: Gentry and McQuiston; (2) Williamson River: Merritt; (3) Sprague River No. IV; (4) Sprague River Nos. I–III; (5) Medicine Rock Cave; (6) Kawumkan Springs Midden. Others as indicated by code name in text.

tern. More detailed discussion will be given in the section dealing with the house pits.

The excavation of the cave and the midden was carried out by regular stratigraphic methods on a grid plan.

In the discussion of the artifacts those from each of the three sources will be handled separately. The cave provided relatively few artifacts and these will be discussed according to their provenience from above or below the Mount Mazama pumice. The midden material is by far the most numerous. Excavation of the midden was carried out by arbitrary levels of 40 cm. in depth measured from our datum point with an assumed elevation of 100 m. Since the midden showed no geological stratigraphy there was no other way to handle it than by arbitrary levels. Checks indicated that shallower levels apparently did not give any better breakdown of cultural materials than did the 40 cm. ones, and, therefore, in view of the greater economy in time and money in using 40 cm. levels, that method was used. However, a study of the profiles (fig. 2) and the map (map 4), p. 403, showed that both the surface and the bottom of the midden sloped off toward the Sprague River. Since we were operating by levels established from a bench mark, our cross trench running down the slope had the first level run only part way across the midden. In the case of the bottom level it only extended through a part of the down slope section of the mound. It seemed logical, therefore, in analyzing the materials to readjust the levels according to depths below the surface. Accordingly, all materials were then organized and analyzed by 40 cm. levels measured from the surface. This could easily be done since the depth of the materials was controlled and the horizontal location established by the grid system.

Since there were unequal amounts of midden excavated in each of the levels obviously the number of artifacts, other things being equal, would be a function of the amount of dirt removed. Therefore, it was necessary to hold constant this factor, the midden volume excavated by levels, in order to determine the variation in the concentration of artifacts by levels. To do this Level II was used as the control for volume. Level I, owing to certain experiments in excavating, had the greatest volume and Levels III and IV progressively less with an extremely small amount in Level V. The actual number of artifacts was calculated for each level, then the ratio of volume of dirt of each level to Level II. This ratio was then applied to the actual number of artifacts in each level and this gave the "adjusted" number of artifacts for each level if that level had had the same volume as Level II, but the original artifact concentration.

The Klamath Indian habitat will be briefly described followed by an abstract of Klamath culture as it was at the time of white contact. Since it was hoped that we could establish a culture column of reasonable length by the excavation of Medicine Rock Cave and the Kawumkan Springs Midden into which the materials from the village sites could be placed by cross identification, these two sites will be discussed separately. The house types of the area as shown by the archaeological evidence will next be described. The artifact inventory is discussed separately from the structural features of the houses and in the chapter following. Next the changing ecological adaptation will be discussed followed by an examination of the dog burials and human skeletons. Detailed reports on these last two subjects will appear in special appendices. Finally, an effort will be made to formulate a cultural and chronological developmental sequence, and evaluate the relation of the Klamath culture to that of the Northern Great Basin. Appendices in addition to those just mentioned will give artifact inventories from the house pits and information on animal remains.

II. THE KLAMATH INDIAN HABITAT

LAND USE AND SETTLEMENT AREAS

The Klamath Indian Reservation (map 3), while not occupying the entire area of coverage of land-use of the pre-reservation days, nevertheless includes in its boundary a large section of the area originally claimed by the Klamaths. The reservation includes an area of 50 square miles and contains over 1,000,000 acres.[1] The northern boundary is marked by the southern line of the first series of sections south of the northern boundary of T.29 S. and extends to T.37 S. On the west the boundary is marked approximately by the center of R.7 E. and extends through R.13 E., Willamette Meridian. At T.33 S. the west boundary extends west to Wood River which it then follows south to Klamath Lake and continues south along the eastern shoreline to the southern boundary. Klamath Lake is thus excluded from the reservation. The reservation does not make a rectangle for there is a square of 4 townships excluded in the northeastern corner. The southern boundary does not run in a straight east-west line but starting with R.11½ E. it extends southward in a series of jogs almost through T.37 S.

In terms of latitude and longitude the boundaries are approximately as follows: the northern boundary is at 43°5′ and the southern boundary just north of 42°20′ north latitude; the eastern boundary follows closely the meridian at 121°5′ and the western approximates a line on the meridian, 121°55′ west longitude. The General Land Office mapping system of range and township lines enables one to make reasonably accurate locations of any points while the latitude and longitude designations provide a reference for any ecological considerations.

In terms of land use the aboriginal habitat (fig. 38)

[1] The exact area of land tenure held by the Klamath Indians "from time immemorial" is now in process of adjudication before the U. S. Court of Claims.

has to include Klamath Lake, an extension northward for an uncertain distance into the Deschutes River drainage leading toward the Columbia, and eastward toward and probably to the western rim of the Silver Lake Valley running southeasterly from there along the Winter Rim, the escarpment of which closes in the Summer Lake-Chewaucan Marsh Valley on the southwest, and then southward probably some distance west of the Goose Lake Valley. No aboriginal boundary in country of this nature is sharply defined. Spier (1930: Map of Klamath Territory, fig. 1) shows, in addition to this approximate land use area, the land extending to the summit of the Cascade Range on the west. It may be seen from this statement of probable areas of aboriginal land use that the reservation excludes a substantial portion but it does include the old nucleus of the area, as far as the pattern of settlement is concerned. Spier (1930: figs. 2 and 3, showing settlements in Klamath territory) shows a series of villages along the east shore of Klamath Lake outside the present limits of the reservation to the southern end of the lake, and on the west side at the south end and further north around the area known as Pelican Bay. The heavy concentration of villages before white contact was on the Klamath Marsh in the north, along the Williamson River below its confluence with the Sprague River at the present town of Chiloquin, and some scattered sites along the Sprague River. Permanent nuclei of settlements may then, for all practical purposes, be limited to the Klamath Marsh (much more important during the summer than winter), the lower Williamson River, and the Sprague River for a distance of approximately 15 miles east of the confluence with the Williamson. From this area of settlement the Klamaths exploited the resources of the land, the rivers, and the lakes in the larger area.

TOPOGRAPHIC FEATURES

FAULTS

The topographic features of the Klamath habitat are in part those of the Great Basin, in part those of the eastern margin of the Cascade Mountain region with its volcanism, and finally those caused by the extensive lacustrine deposits of Pliocene origin on which much of the later deposits rest. The Great Basin features are seen in the generally northwest to southeast axis of the ranges and the extensive faulting along this axis. The eastern shore line of Klamath Lake is made by the great fault escarpment which extends for nearly 50 miles and then with a slight break extends southeastward to include Stukel Mountain in northern California. Some 8 to 10 miles east another prominent fault follows the same axis running just west of Saddle Mountain and across the area on which the Kawumkan Springs site is located. A minor transverse fault across the main one is the cause for the many springs which give the place its name, Kawumkan Springs. An examination of the road pattern on the Fire Control map for the Klamath Reservation shows the northwest to southeast direction of the ridges and the intervening valleys. The eastern boundary of the area is marked by the great Winter Rim which forms the escarpment of the fault basin of Summer Lake while slightly to the north a somewhat comparable structural feature closes off the area from the Silver Lake valley.

VOLCANISM

Volcanic ejecta are widely spread over the area. Volcanic cones, such as Calimus Butte, Yamsay Mountain, to mention but two, are eastern extensions of the volcanic sources of the Cascade Range. Characteristic rimrock features are to be found scattered through both the sage brush areas and the yellow pine forest. Remains of a capping of vesicular basalt rest upon the edge of the Kawumkan Springs site. Slightly over a mile northeast on the McCready Ranch are ridges of fine grained lava which terminate abruptly in what appears to be "pillow lava." Evidence of older volcanism is to be found in the beds of consolidated and often decomposed tuff where erosion or faulting has exposed them. The Sprague River, which runs the width of the reservation from east to west, as far as Chiloquin, is never clear even in late summer because of the amount of fine volcanic materials carried in solution.

LACUSTRINE DEPOSITS

Underneath much of the area lie the remains of Pliocene lake deposits appearing as white, diatomaceous deposits in road cuts, fault surfaces, and well logs. Probably the best exposure of the old lacustrine formations is to be seen along Highway 97 where it drops down from the lava plateau to the bed of the Williamson River some few miles north of the Chiloquin Junction. Along the highway from Chiloquin to Sprague River (the small town) there are to be seen many exposures of the diatomaceous deposits in the road cuts. This highway follows the valley of the Sprague River which has cut down through the more recent materials.

ARIDITY

The aridity of the area, as far as precipitation is considered, makes for little erosion. The average annual precipitation for Klamath Falls over a 39-year period was 12.38 inches and for Chiloquin, approximately 40 miles to the north, 15.36 for a 30-year period, as of 1941 (*Yearbook of Agriculture*, 1941, *Climate and Man*, p. 1077). The primary erosion has been caused by the Williamson and the Sprague Rivers, and this has been limited, therefore, to the narrow canyons and meanders of these rivers where they have emerged from the narrow beds of the defiles. The precipitation is sufficient to provide for an excellent growth of yellow pine (*Pinus ponderosa*) in certain sections of the habi-

tat. Except for the pine forests, in many places interspersed with sage brush plains and grassy meadows along the rivers, the habitat is strongly reminiscent of the rugged, sharp features of the Great Basin.

VEGETATION

FOREST COVER

Attention has already been called to the extensive yellow pine forests of the area. Juniper is found infrequently as compared with its abundance in the Great Basin. Along the rivers and in the moister areas about springs quaking aspens (*Populus tremuloides*) occur, giving a bright green to the landscape during the summer and a luminous golden color against the dark green of the conifers after the frosts in early autumn. Along the rivers the meadows provide a rich growth of natural grasses and the bottom lands are now rich agricultural areas. As soon as one moves away from the rivers in the open areas the sage brush takes over. In earlier times this must have been interspersed with bunch grass, as was the sage brush area of the Great Basin to the east. Most of the area lies in the arid Transition zone (Bailey, 1936: map, Life Zones of Oregon). A narrow strip of the Upper Sonoran zone runs south along the east shore line of Klamath Lake, starting south of the Williamson River, and extending south of Klamath Falls, then running easterly to a point about in line with the eastern boundary of the reservation. In the north a small section is classed in the Canadian zone, as is a narrow strip running east across the reservation from east of Modoc Point. The variations of Life Zones reflect to a large extent differences in elevations. For all practical purposes the Upper Sonoran zone may be excluded from the main Klamath habitat and be assigned to that of the Modoc, their neighbors on the south. The nucleus of the settlement area falls in the Arid Transition zone and the vegetation cover is to be attributed mainly to that type.

WOCAS

In the Klamath Marsh in the northern part of the settlement area attention should be called to the *Wocas* (*Nuphar polysepalum*), or water lily, the seeds of which became a staple article of diet in Klamath economy, at least in late prehistoric times. While these plants are to be found at other places along the Williamson and Sprague Rivers the main source of supply was the Klamath Marsh. The exploitation of this resource was a major factor in the seasonal movements of the villages and in the women's activities at certain times of the year. Their exploitation also brought about technological developments the better to achieve this end.

Gatschet (1890) and Coville (1904) have listed the main food and other plants which in one way or another are utilized by the Klamath. Of particular importance in this case is the tule (*Scirpus lacustris*) and the cattail (*Typha latifolia*) which provided the main materials for the excellent basketry. These plants are found around the shores of the lakes and the swamps and the quiet water of the rivers. The tule and cattail, which are still found in the Northern Great Basin where sufficient water exists, were during the moist periods found there in abundance. The same holds true for the common cane (*Phragmites phragmites*) which was used in the compound arrow and also as a food source.

A large variety of roots and seeds was provided by the area and utilized as food. Like the *Wocas,* the ripening of the seeds and the maturing of the roots were important in affecting the round of women's activities.

FAUNA

MAMMALS

While the country provided a rich land fauna there is no clear evidence that the Klamath Indians exploited the larger varieties heavily. Bailey (1936: tables 1–8) lists the mammals and plants of the region and there is no point in repeating the list here. Among the larger mammals were the mule deer (*Odocoileus hemionus macrotis*), varieties of bear, including the grizzly, and a variety of elk. The last is not reported by Bailey but we found worked elk antler in the Kawumkan Springs Midden and elkhorn wedges and picks are reported ethnographically. (Barrett, 1910: 252; Spier, 1930: 171–172.)

FISH

More important than the land mammals in the Klamath economy were the fish of the rivers and the lake, and the mussels found in great abundance in the river. Salmon, varieties of trout, suckers, and smaller fish were all to be had in abundance. Spier (1930: 145 ff.) has emphasized the heavy reliance of the Klamath on the fish resources in contrast with the land mammals and the archaeological evidence supports his findings for a long period in the past. Thus, while the land and the rivers offered a wide variety of food resources for a rich protein diet, the Klamath Indians exploited the possibilities quite selectively. The richness of the fauna is not an indication of the extent of its exploitation.

COMPARISON OF THE KLAMATH HABITAT WITH THE ADJACENT GREAT BASIN

It may be useful at this point to call attention briefly to certain of the similarities between the Klamath habitat and that of the Northern Great Basin on the northeast and east. There is first the great similarity in the structural features based upon faulting together with the volcanism so characteristic of both areas. In sharp contrast with this is the aridity of the Great Basin and the greater moisture of the Klamath area. Throughout the Neothermal this difference must have remained *relatively* the same even with the periods of greater

precipitation in the Basin. In addition to the difference in rainfall patterns, there is a difference in water supply. Most of the lake beds of the Northern Great Basin now have either playas in the late spring or early summer or are dry all together. There are some exceptions but where water lies in these valleys it is usually brackish and of little use for drinking. Two notable exceptions are to be found in Oregon but their significance for human occupation is quite limited areally. The first of these is the great spring or series of them on the west side of Steens Mountain at Roaring Springs Ranch (Cressman, 1942) and the other is Ana Spring near the northern end of Summer Lake. There is little likelihood that either of these ever dried up since both have their origin in the fault structure of the respective basins. The Blitzen River, which has its sources in the high Steens and springs, flows north to Malheur Lake but until it was diked for a wild life preserve, it ended mostly in the marshes of the Blitzen Valley. The Chewaucan River, like the Blitzen, rather overnamed, heads up in the mountains on the west side of Summer Lake flowing into the valley at Paisley. Probably both of these streams flowed to a greater or less extent during the Altithermal, but to what extent is unknown. The occupation of the Paisley Caves in Summer Lake during the Altithermal means that the occupants probably drew on both Ana Spring and the Chewaucan River for water. The latter is about 5 miles from the caves at the nearest point, while the former is approximately 20 miles at the source but would, of course, have provided a nearer water supply farther down its drainage system. In contrast with this variation in water supply during the Neothermal, the Klamath area was favored with a constant supply. As has been pointed out earlier, the Klamath area is watered by perennially flowing rivers and springs. The lack of variation in the level of Klamath Lake shows that there was a relatively constant water supply. During the season of 1940, when working at Lower Klamath Lake, Cressman, with Dr. Ernst Antevs, Dr. Ira Allison of Oregon State College, and the late Dr. W. D. Smith of the University of Oregon, studied the shore line of Klamath Lake for terrace structures. The terraces are only about 6–8 feet above the present level of the lake. Thus, there could not have been much variation in the water supply in the Klamath habitat during the Neothermal. The Klamath River drew off the excess rainfall.

The Great Basin in Oregon shows much the same range of fauna as does the Klamath Lake Basin, except that while bison have been found from the earliest times in the Basin, they have not been recorded for the Klamath area. Likewise, the elk is found in the Klamath area but was not reported in the Great Basin. Cressman (1942: 63) reports elk bones in Roaring Springs Cave. (*Equus* and camel have been reported for Summer Lake and Lower Klamath Lake with probably mammoth for the latter. These are so far lacking in the Klamath area.) The preservation of bones depends so much upon the nature of the deposits in which they are dropped that the archaeological record is incomplete because of selective preservation, the preferential food habits of the people, and the chance discovery by the archaeologist. However, while there seems to have been no great difference in the faunal resources, there was a vast difference in their exploitation by the peoples of the area.

In both areas the most common ground cover is sage brush, outside the wooded areas of the Klamath Basin, and the archaeological record would indicate that this was true for the Great Basin throughout the Neothermal. Greasewood (*Sarcobatus vermiculatus*) is abundant in the Great Basin area but not in the Klamath. Tule was common to both areas and was much more widely spread in the Great Basin when the climate was more moist. The same holds true for *Phragmites*. The most striking difference in flora is the presence of yellow pine in the Klamath area and its almost complete absence in the Great Basin. Under more favorable climatic conditions it was to be found in greater amounts than now in the Great Basin (Hansen, 1947: 102–105).

Obsidian and basalts were to be found in both areas and, in contrast to the other resources, are independent of climatic differences.

While fresh-water mussels are to be found in the Great Basin evidence of their use is scanty, while in the Klamath area they are to be found in great numbers and heavy reliance was placed on them. A further contrast between the two areas is to be found in the fish resources available to the Klamath and practically lacking in the Northern Great Basin.

Finally, then, it is necessary to keep in mind that the Klamath environment seems to show little evidence of change through the Neothermal while profound changes occurred in the Great Basin. The similarities between the resources of the two areas at present strongly suggest that at more favorable times in the Great Basin the two areas were much more alike than a casual consideration would suggest, except for the forest cover and its consequent effect upon certain fauna.

III. THE KLAMATH CULTURE

We are indebted to a small number of students who have contributed excellent information on the nature of Klamath culture (Gatschet, 1890, 1879; Spier, 1930, the most comprehensive account, 1935; Barrett, 1910; Nash, 1937; Dubois, 1939; Pearsall, 1950; Zakoji, 1952; and Stern, 1950, 1956). Gatschet's work is of particular importance because the information was collected soon after the establishment of the reservation and his informants knew the aboriginal way of life. Spier's excellent monograph is based on information collected in 1925 and 1926 from aged informants who

still remembered the aboriginal pattern. Barrett's work is limited to the material culture of the Klamath and Modoc, but this orientation gives it a special utility for the archaeologist. Pearsall is concerned with the education and training of children. Nash, Dubois, and Spier (1935) are concerned with processes of cultural change as manifested within certain aspects of religious movements resulting from direct or indirect contact with Euro-American culture. Spencer (1952) has been concerned with aspects of religion and social structure. Zakoji's study is one of acculturation in which the changes from the original patterns are documented and illustrated by the use of two autobiographical sketches. The causative situations and the processes are discussed. Stern is concerned, in the publication referred to, with Klamath mythology and has under way further studies in Klamath community organization and participation together with analysis of those processes evident in Klamath culture contacts and culture change. It is, therefore, primarily the prehistoric range of Klamath culture which is not described. In this section we shall describe briefly the Klamath culture with emphasis on those aspects, the technological and the economic, which may be compared with the archaeological record. No full treatment of Klamath culture is intended here since it is available in the sources referred to. A sufficient description will be given here to place it in perspective for the archaeological record.

FOOD GATHERING ACTIVITIES AND RELATED PATTERNS

The Klamath Indians had built a culture that was integrated around the resources of the rivers and the swamps of their area, with a lesser emphasis on the exploitation of the open lake. Hunting of large mammals took a secondary place to the utilization of the riverine and marsh resources. The rivers furnished salmon, trout, suckers, and mussels. Wild fowl frequented the area in the migration seasons and provided an important source of food. Camas roots, the ipos root, and the *Wocas* seeds were all important articles of diet, and of these the *Wocas* were the most important. The taking of fish, of waterfowl, and the gathering and preparation of *Wocas* seeds each produced the development of patterns of behavior and instruments appropriate to the activity.

FISH

Fish were taken by hook and line with a simple gorge used for a hook in one method, and a double hook from a single shank in the other, by harpoon, and by a special multipointed gig and harpoon combination. Dip and gill nets were also used. A large triangular shaped dip net was used from the bow of a canoe and a smaller circular net from the bank or the canoe. The gill net was stretched across small streams and involved the use of tule floats and grooved elliptical or triangular shaped stone sinkers. We have no reports on any patterned behavior for the gathering of mussels, but they could be secured easily enough by the hands from the shallow waters of the rivers. If they were gathered from the deeper water, and how, we do not know. Nor do we know whether men or women gathered them. Fishing was a man's occupation and gathering of roots and seeds a woman's.

WATERFOWL

Waterfowl were sometimes taken in nets stretched between canoes. This method was used at night when a fire was kindled in a canoe and the waterfowl flew toward the light and became entangled in the net. They were shot with arrows with a wooden foreshaft and a special arrow with a wooden foreshaft with a slight ridge either carved around the foreshaft or built up by pitch so that the arrow ricocheted when it struck the water and was more likely to hit a target in a flock of birds as it skipped along the surface.

WOCAS

Wocas gathering and the preparation of the seeds for food was of fundamental importance in that it brought about seasonal migration of whole villages to the *Wocas* marshes, the development of instruments for collecting and a special set of grinding stones and techniques for its preparation. August saw the villages move to the *Wocas* areas. A somewhat smaller and narrower canoe was used for gathering the seeds than for fishing. A special pole with a split distal end held apart by a bone or block of wood was used for pushing the canoe in the shallow water with a mud bottom. A dipper made of tule was used to scoop *Wocas* seeds off the water and in shallow water with a reasonably firm bottom the woman waded, floating a small tule container made like a canoe in which she gathered the seeds.

GRINDING TOOLS FOR WOCAS

In grinding the seeds a thin metate was used with the end away from the worker and resting in a large circular tray. Grinding was done with the distinctive two-handled or two-horned muller or mano as it is called. The horns sloped away from the worker and the thumbs rested against the side of the horns toward the woman. The stroke was forward and backward with a very light pressure of the thumbs. These two-horned manos are distinctive of the Klamath culture and were used with the *Wocas* industry. A great deal of care was lavished on the manufacture of some of these, far more than was needed to make only an efficient tool (fig. 50-5). I recall an aged Klamath woman, whom I interviewed about 1938, bringing one of these from her heirlooms for me to see, but she was very reluctant to let it out of her hands. She held it

in one hand and moved the other hand about over it as though she were fondling it and at the same time talking quietly to herself in the Klamath language.

The archaeological record shows that these tools are a fairly late development in Klamath technology. That they were highly developed by 1540 we know from evidence that will be discussed later, but we also know that there was a process of development before that and a long period of time when the tool was lacking.

COMMON GRINDING TOOLS

For grinding other seeds different kinds of manos were used. The most common was the oval to round shaped stone used in one hand with a circular motion for the most part, if we can judge from the shape of the manos and the worn surface of the metates. However, other styles developed apparently as a means of more readily making possible a better control of the grinding process and the protection of the fingertips of the operator. Here we find those with a groove running around the stone for the fingertips to fit into, those which are almost hemispherical, and others with a ridge-like piece running across the top for a grip; one has the grip across the center axis and another has it offset toward the edge (fig. 13). These latter types like the two-horned mano appear about the same time in the archaeological record. In the protohistoric villages all types are found.

Metates, except for those used in grinding paint and for *Wocas* preparation, would be most aptly called the block type.

Mortars and pestles were not made in any great numbers for these could be picked up in various areas from the earlier users if desired. Some mortars were used by older people for grinding or softening roots and seeds if their teeth were decayed or missing. Sometimes paint was ground in small mortars and pestles.

Mauls were used for driving elk horn wedges and these sometimes were decorated (fig. 69-1).

Both the yellow pine and the lodgepole pine provided a source of food. Spier (1930: 166) writes, "In April the cambium layer of the lodgepole pine is similarly scraped off and eaten." He is referring to the practice of cutting off a large section of bark of the yellow pine, usually in May, and scraping off the "sweet mucilaginous layer of newly formed tissue between the bark and sap wood" (1930: 165). The Indians in gathering this material were very careful not to girdle the trees for that would have killed them. Near old villages in parts of the yellow pine forests which have not been lumbered off, there are many trees with these large scars made by the removal of the bark to secure this food (fig. 39-1, 2). Barrett (1910: pl. 22, fig. 5) illustrates a bone knife used for separating the bark. Coville (1897, 1904) has given a full list of the food plants of the Klamaths and the reader is referred to that source.

HUNTING

While game is varied and plentiful in the Klamath country, the Klamath are not much given to hunting. As one informant phrased it, "We know very little about hunting deer." Their attitude is betrayed by the exaggerated value put on elk hides, although elk were plentiful. And while fish can be taken by anyone, success in hunting is assured only to one who has spirit power. In a word, the Klamath prefer the easier exploitation of stream, marsh, and prairie to invasion of the forest-clad mountains which invite only the solitary seeker after power (Spier, 1930: 155).

Spier (pp. 156–157) gives a list of 44 animals listed by his informants as eaten by them. Of this list 24 are birds, all but two being waterfowl, and 11 are small mammals. This shows the relative unimportance of hunting land mammals. Twenty-one animals are listed as not being eaten. Of these only one is a bird, probably a tern (described as a small gull; has a swallow tail), and the others consist of the larger carnivores and small rodents.

SEASONAL MOVEMENTS

The food habits of the Klamaths obviously caused them to focus their interests on different sections of the region at different seasons as the roots became edible, the seeds ripened, the game was available, the waterfowl migrated, and the fish were to be taken in the rivers. Their permanent food supply, if one may use that term, or perhaps the one on which they could depend with greatest confidence at all times of the year, consisted of the fish and mussels to be taken from the streams. In winter this source was especially important. Perhaps because of this reliance on the rivers for their food, perhaps because greater protection was to be found along the rivers from the bitter winter cold, or for both reasons the permanent villages are to be found along the rivers with some few scattered on the west shore of the lake. As we have pointed out, most of the village sites are concentrated along the Williamson River below its confluence with the Sprague River and at the south end of the Klamath Marsh. Other villages are found to the east along the Sprague with a grouping at Kawumkan Springs, but further east there are very few recorded although small middens are found along the banks. Probably the reason for this limitation on the eastward extension of villages is that the Sprague River east of Kawumkan Springs freezes to a great depth while the Springs have never been known to freeze over and the large amount of water they discharge into the Sprague keeps it generally open between there and the Williamson. In the summer of 1949 I was told by a rancher, who owns land about one mile up the river from the Springs, that during the bitter cold of the preceding winter he was unable to keep a hole open through the ice as a waterhole for his cattle. Finally he tried to break the ice with a large bulldozer, bouncing the heavy blade up and down on the ice, but was unsuccessful.

Yet Kawumkan Springs, only a mile away, never froze over and the river below was open.

CANOES

For people who depended so much on the river and marsh environment for their livelihood, the canoe was indispensable. The canoe is a simple dug-out made preferably from a fir log. Canoes varied in length according to the use to be made of them, but the width was surprisingly uniform, 18 to 24 inches, according to Spier. The width is determined by the customary size of the firs in the region. Spier states that most of the canoes were from 10 to 20 feet long although for use on the open lake they might be as long as 35 feet.

The log was hollowed out by adzing and burning. "The ends are cut off on a flat bevel at an upward angle of thirty to forty degrees with its axis" (Spier, 1930: 170). The angle at the prow is sharper than at the stern and the stern is kept thicker than the prow so that more weight is thrown aft. This enables the single paddler to manipulate the canoe more easily. Barrett states that in case of a second paddler he kneels near the center of the canoe. The location of the paddlers keeps the prow fairly well out of water. The canoe is finished so that the sides may be anywhere from an inch to 2 or 3 inches thick while the prow and stern are thicker.

While the canoe is ordinarily propelled by paddles, in the marshes it is poled. A special pole made from lodge pole pine, from which the bark has been peeled, is split at the distal end for several inches. Between the separated pieces of the end a piece of bone or hardwood is fastened as a separator to hold the pieces apart at an angle of about 45 degrees. This separated portion with the cross piece will catch on roots or other debris in the marsh and shallow water, and thus make possible efficient poling. Two canoes in the Oregon State Museum of Anthropology at the University of Oregon measure 14 feet, 2 inches long, 2 feet, 6 inches wide, and 14 inches deep; and 14 feet, 4 inches long, 1 foot, 7 inches wide, and 12 inches deep. The first is a general purpose type and the latter is for *Wocas* gathering. The *Wocas* gathering canoe was supposed to be somewhat smaller than the other kind, but this one is slightly longer although smaller otherwise.

HOUSE TYPES

It is at the fixed villages to which the people returned each autumn, year after year, that the permanent houses are to be found. Permanent, as used here, has a relative meaning as compared with the temporary shelters of the summer camps. Each autumn when the families returned to their "homes" they put the houses in shape to provide sound dwellings for the winter.

EARTH LODGE

Spier (1930: 197–203) has described in detail the permanent or semi-subterranean house. It should be pointed out here that only one of the many houses we excavated during four seasons' work corresponds very closely to the house pattern informants gave Spier. However, Spier was describing the "pattern" of a house and we were digging up houses which showed how in this, as every other pattern of behavior, the realization was an approximation of the "pattern." The archaeological evidence will be presented later. Following Spier's description we find the Klamath winter or permanent house consisting of a truncated cone superstructure set into and reaching up out of a circular pit dug to a depth of perhaps 2 feet. The diameter of the pits varies from 10 to 20 and more feet. There are some considerably larger than this. A large house pit on the F. F. McCready Ranch, near Kawumkan Springs, Kl-9, excavated in 1951, was 16 m. from rim to rim and 9 m. across the floor. The floor in this house was 2 m. below the surface. Another, Kl-12 (only tested), on the same ranch was 19 m. in diameter and 2.5 m. deep. These two houses, however, were unusually large and the growth of trees in the pits indicated a considerable antiquity for them.

The main support of the house consisted of 4 posts each 12 inches in diameter set in a rectangular pattern and tied together at the top by 4 stringers, 2 of which at each end, the shorter ones, were put in place first and then on top of these 2 longer ones were fastened on each of the long sides of the rectangle. The posts have forks about 9 to 10 feet above the ground floor. Four main rafters ran out obliquely from the corners of the rectangle and were fastened in the earth on the outside of the lip of the pit. These poles are split logs. Across each pair of these rafters at the top along the long axis a plank is fastened. Then a series of planks or poles is arranged continuously along each of these horizontal planks with the top resting on the plank and the other end resting on the surface of the ground outside the pit. A continuous series of rafters thus surrounds the house to provide the support for the roof covering. At the ends of the rectangle the poles rest their upper ends directly on the short cross stringers.

The hatchway is now built by laying a series of poles lengthwise on each side of the long stringers and resting on the short tie pieces, thus narrowing the opening. Since the size of the rectangle formed by the posts will be dependent on the size of the house, it is difficult to give an approximate size for the hatchway. Spier (1930: 199) states, "The hatchway is nearly as wide as the spacing of the long stringers (C), three to four feet; its forward end is quite close to the cross-member (B) at the front of the house, but the roof is decked over for several feet at the rear, leaving an opening some ten feet in length." When the hatchway is narrowed sufficiently by the addition of long poles on each side, the shorter cross poles are placed on top of these at right angles starting from the end. A ladder, of two poles with the rungs tied on at spaces of about a foot,

rises nearly vertically and protrudes some distance above the opening. During the day the hatchway was open but at night a mat which rested on the short cross pieces was unrolled full length over the opening after placing supporting cross sticks for it.

After the side rafters are all in place the roof is covered with a series of large mats laid horizontally in clapboard fashion. Grass is placed over the lower half of the mats and then the excavated dirt is thrown over the grass and mats to form a tight covering. The house thus slopes sharply from the surrounding surface to end in a truncated, wedge-shaped top. Access is gained by a kind of combination of ladder-step device made of two small logs with branches projecting from the sides. These are laid close together on the roof so that the projecting branches from each meet the trunk of the other. The space between the cross branches is then packed with dirt to make steps.

Houses were supposed to have the opening toward the southeast and so the ladder would be on that side. However, the orientation of the house may have depended on its relation to the river. Spier's informants insisted that the house was always oriented toward the southeast, claiming that this was because the prevailing winds came from the west.

Barrett (1910: 244) gives a much simplified description of the winter earth lodge but differs from Spier in stating that there was a single supporting pole for the roof and that this sometimes served as the ladder as well. The ladder consisted of a pole with steps cut clear through the pole. This pattern Spier's informant uniformly denied.

The area on top of the unexcavated surface about the house and under the roof was used for storage.

I am indebted to my colleague, Dr. Theodore Stern, for the following notes.

Klamath Early Lodge. The following incomplete notes were gathered incidentally in the course of other research in the summer, 1951, from Tom Lang, Klamath traditionalist and onetime informant for L. Spier. Tom had been inside what his wife terms a "dirt house" (the Klamath means winter camp or staying place, loult 'malaks) only once or twice; he may be generalizing from this experience. However, he has had ample opportunity to discuss the matter with elders. Read the following with Spier in mind.

The excavation itself is 1 to 4 feet deep (a known excavation over a man's height below the surface is regarded by Tom as hailing from mythical times). Within, four posts (material not specified) are set in intercardinal position, midway, radially from the center. In the groove in the top of each post a pair of poles (material not specified) will be set. Paired poles span adjacent posts on each side; then paired poles resting on top of them bridge the other two sides. This forms a plate upon which rafters are laid, the outer ends resting about a foot beyond the edge of the excavation. Rafters always run outward from the post locations themselves, as well as from other portions of the plate. Horizontal poles are now lashed on to the rafters themselves. (Materials again unspecified.) Horizontal rafters span the space within the plate. On top of this coarse tule mats are laid, with dirt above, to finish the house. A square or rectangular roof entrance-smoke hole is left. A ladder, in form said to resemble our rung-ladder, is laid up the eastern side, and a ladder within rests against the eastern edge of the entrance and leads down. The Klamath, by their directional nomenclature, always conceive of the house as facing east. The place behind the fire, where meat may be hung to dry, is always referred to as 'tkalamdal, westward. (Eastward: lubital.)

Within, there is a central fireplace located, probably, just west of the foot of the inner ladder. Tom denies that there was a bench or platform running around the inside of the wall. "I always heard that the people slept and sat on the ground." The western part of the house was partitioned off by a wall of vertical poles laid against a horizontal beam. This room was used for storage. The eastern portion of the house "behind the ladder" was devoted to the storage of firewood and other miscellaneous objects. (Foodstuffs, among other things, being stored in the western partition.) Against the wall, on the northern side, was the place reserved for the owner and his family. The "old ladies," e.g. the owner's widowed mother, lived in the northwest corner by the wall of the storage room. Along the south side of the dwelling lived another family, often related. Often only one family lived in a house; but multiple-family dwellings such as this were asserted to be more common.

Lieutenant Williamson, in charge of the party making a survey for a railroad to the Pacific Ocean in 1854–1855, passed along the Klamath Marsh and has given the following description of the houses there.

We decided to follow the eastern shore of the marsh. We soon reached a collection of Indian huts built near the edge of the water. Our two friends had evidently been there before us, for the rancheria had been very recently deserted. Large quantities of food, consisting mostly of seeds of plants and dried fish, several canoes made of hollowed logs, many baskets formed of reeds curiously woven together, and divers other valuables, were scattered around in wild confusion. The fires were burning in front of the huts, of which there were three distinct kinds. The summer lodges had vertical walls supporting flat roofs. They were composed of a framework of sticks, covered with a matting of woven tule. The winter huts were shaped like beehives and made of sticks plastered with mud. We noticed only one of the third kind, which was apparently used for a council house. A hole, about four feet deep and ten feet square, had been excavated, and the earth heaped up around the sides. Large sticks planted in this mud wall supported a roof made of cross poles covered with earth. The entrance was a flight of mud steps that conducted to the roof, from which a rude ladder led through a hole to the floor below (1857: p. 68).

Those families which had insufficient wealth or lacked sufficient numbers to form a cooperative working party built a simpler form of earth lodge. This was usually built over a rather shallow pit supported by small poles or saplings fastened at the top into a dome-shaped structure. It was covered with mats but lacked the substantial cover of the typical earth-lodge. The entrance to this house was on the ground surface. A mat was suspended inside the door to protect the occupants against the wind. These houses, while tending to be round, might vary toward an oval or rectangular floor

plan. One house, SR-2 on the Sprague River, excavated in 1947, seems to have been this kind of house. It will be described in detail later, but since it dates from the late period of Klamath history and throws some light on this type of house, brief reference will be made to it here. This house tended to be round at the ground level but as the pit increased in depth the outline became more oval. A bench surrounded the bottom of the pit. The oval-shaped part of the pit was 3.3 m. by 2.35 m. within the edges of the bench. There was but one house post, approximately in the center. Center of the fire pit is about 85 cm. north and west of the post hole. In the northeast section the bench is cut out to a level about 23 cm. above the pit floor. This depression seems to have been the entrance which allowed a very short step down. It faced up the river, away from the prevailing winds. The simplicity of construction, the surface entrance, the orientation up river from the wind, the smallness of the house, all features which differentiate it as a whole from a well-constructed, large earth lodge close by, strongly suggests that this is an example of the adaptation of the house pattern to the capacities of the poorer family.

THE SUMMER HOUSE

The summer house was usually built with little or no pit and was generally a dome-shaped affair covered with mats. It would leave little archaeological record. Another type was also used. This was built on a rectangular floor plan above ground. Willow poles were set into the ground along the sides and sloped at a sharp angle to a light ridge pole. Along the sides were placed stringers to tie the sloping willows into a firm structure. Across the top and along the sides, starting from the bottom, were placed specially prepared tule mats as covering. These mats were sewed except at the edges where they were twined. The sewing prevented the rain being caught and soaking through as would have been the case with a twined weft construction. These mats were then placed on in clapboard fashion to facilitate drainage. The houses were sufficiently high to permit an adult to stand upright. Entrance was at one end. This kind of house would leave no direct archaeological evidence, but only indirect in the form of tools that might have been abandoned.

SWEAT HOUSES

Sweat houses were of two kinds, a round, dome-shaped structure used in summer and a more solid, gable-shaped type used in winter. The gable-shaped variety is built over a shallow elliptical pit about 5 feet in length. The ridge pole is supported by a pair of struts at each end pushed into the edges of the pit. Sticks and bark are then leaned up against the ridge pole and this "roof" is covered with dry grass and dirt. The ridge pole is about three and a half feet above ground. The small end entrance is covered with a mat. Stones, heated outside, are rolled into the house and after they have cooled somewhat water is thrown on them for steam. One excavated on the Williamson River indicated that there was a pit near the center into which the stones were rolled. Apparently the stones were not cleaned out between times of use for the pile of thermal cracked stones here came well above the floor.

The gable end sweat lodge, a much larger type, was used for ceremonial sweating and perhaps indicates an older pattern than the round summer lodge.

COSTUME

Costume, as house types, usually reflects status difference where there is any complexity in either aspect of culture. The Klamath during perhaps the last three-quarters of a century of their precontact life were going through a process of changes in which prestige came to have a wealth basis. This process is reflected in the changes in costume. By 1800 certain elements of Plains costume were being introduced, through the Columbia River contacts in all likelihood. The men who could afford it were affecting moccasins, leggings, breech-clout, and buckskin shirts, while the women were wearing the long dress of the Plains type and moccasins and short leggings. Spier points out that the earlier costume and that for the less wealthy at the later time was quite simple, a fringed skirt for both sexes and a basketry hat. The fringed skirt was made from tule or sage brush bark cords which hung from a belt. Spier suggests also that buckskin cords possibly were used. The cords were most closely set in front and back and but few at the sides to cover the hips. Those for women extended below the knees while the men's did not reach the knee. Spier suggests that the name for the part in front, "hangs between the legs," and "hangs behind," points to a "relation to the familiar two-apron garment of California" (Spier, 1930: 207). It would seem that the names could be descriptively quite independent in view of the fact that there are not two aprons but a single garment with accent on the front and back parts. It could well be that both the Klamath and the California types are derived originally from a basic form with the single garment representing, it seems to me, psychologically the simpler form.

MOCCASINS

When we speak of moccasins, normally the varieties of skin moccasins come to mind. However, if we use the word sandal to refer to footgear which covers only the sole of the foot and moccasin to refer to any form of footgear which has more or less of an upper part attached to the sole, we get into difficulty in handling both the Klamath specimens and archaeological materials as well. Sandals from the Great Basin show a

variety of tie loops and toe flaps which certainly cover a part of the upper part of the foot. Psychologically these are something different from the true moccasin with a cover for the instep and are usually fastened around the ankle. The whole form of the moccasin aids in its staying on the foot. Barrett (1910: pl. 17, fig. 2, 4; pl. 19, fig. 2) illustrates tule "moccasins for winter wear." These are both in form and psychologically something quite different from the skin moccasin. Spier relies on Barrett's description. Barrett, with Spier concurring, assumes that the skin moccasion was worn in summer and the tule in winter since it was designed "primarily to hold a layer of grass next to the foot" (Spier, 1930: 208).

LEGGINGS

Leggings were made both of skin and of tule in a twined pattern similar to a mat. Skin leggings were worn by the more wealthy and the other type by the poorer people. Men's leggings extend to the thigh or full length, and are fastened to the belt at the hips. Women's leggings are calf length and presumably fastened by tying around the leg.

We cannot tell from information at hand if the tule leggings are an early aboriginal type or a later expression in Klamath life of the Plains pattern but adapted to the Klamath's heavy reliance on tule and limited use of large game animals. I am inclined to believe that the latter possibility is more likely the true one. I would prefer to call the tule "moccasins" of Barrett sandals in view of the widespread use of these articles through many thousands of years in the neighboring Great Basin. The archaeological evidence justifies this point of view but lends no support to any theory of any kind of antiquity for the leggings.

FRINGED SKIRT IN SHAMAN'S DANCE

Another item of importance is the use of the fringed skirt worn by the women during the shaman's dance in the earth-lodge. Spier (1930: 210–211) writes:

> But these [the war and scalp dances] are held outdoors at night; and during the shaman's dances in the earth-lodge, the fringed skirt only is worn because of the heat. It is possible, of course, that this is a rationalization of etiquette, for if the shaman's dance is older than the forms of war and scalp dance now in use, there may be an association of the older fringed skirt with one and the new skin dress with the other. There can be little doubt that the fringed skirt is the antecedent form. Plain influences appear to be recent, and the Klamath use of the typical Plains woman's costume is an extreme marginal case in the west.

MISCELLANEOUS ITEMS

Twined basketry hats were worn by both men and women, while men sometimes wore a skin hat in winter and at other times a tule hat shaped something like a helmet (Barrett, 1910: pl. 18, figs. 9–12; pl. 17, fig. 6). Snowshoes were made by stretching pieces of hide across a slightly oval-shaped hoop. One piece of hide extended across the long axis and three ran at right angles to this. There were probably variations on this pattern as Spier's informants indicated a different number of strips of hide. A similar but smaller shoe was worn for wading about the marshes. Women's belts were made of twined cords of bark or human hair or a combination of these two. A layer of grass was stuffed inside the tule moccasin for winter wear. Barrett (1910: 255) states, "The women also wore a cape or, more properly speaking, a blanket, made of shredded tule or of sage brush bark, or of a combination of the two." Spier (1910: 215) records three kinds of beads, "dentalia . . . a small twisted shell, a half inch long . . . and red stone beads . . . flattened like a kernel of corn. In addition there is an abundance of old style, glass trade beads on the cremation piles." According to Spier his informants insisted that they did not get their dentalia from the Columbia River but from the south. This would mean that they were traded up the Klamath River. The dentalia originated from the coast of Washington and Vancouver Island. While the dentalia were valued as wealth symbols, they were quite unimportant in this respect when compared with the value and use they had among the Yurok and their neighbors.

BASKETRY

Basketry was perhaps the most important product of the Klamath people from a number of points of view. If we use the term loosely, basketry was used in house construction in the form of mats, in utensils for the collection of different kinds of seeds and their preparation, in most of their costumes, in their household effects, and as the main outlet for the expression of aesthetic impulses. Yet it is interesting that the basic varieties were so few. Coiled baskets were not made.

TWINED BASKETS

The characteristic Klamath twined basket is made from tule or tule and cattail. The structural features are highly standardized. The warp consists of a double twisted strand of the outer part of the tule and in general the weft is made from the same material. Each weft element consists of a single twisted tule strand. The twist of the twining is always from the inside over and out so that the pitch of the stitch is down to the right. In starting the basket a bundle of warps, often the number that will be required to complete the basket, is bound by the weft in a series of bundles side by side. Then as the circuit increases in size the warps are gradually reduced in number within the wefts until only one warp, the double twisted one, remains. In a basket with straight or vertical sides frequently several rows of three-strand twining are used to strengthen the joint of bottom and side. As a rule in the rim finish the short protruding portion of the warp is bent

over and caught in the second weft over of the final row, alternating warps are cut off flush with the last circuit; this gives a pleasing smooth surface and a certain rigidity to the rim. The bundle-of-warps method of starting is as good as a trade-mark for recognizing a Klamath basket. Spier (1930: 179–180) has fully described the method of basket making for the Klamath. All the fine twined baskets of the Klamath are semi-flexible as a result of the materials used.

Fine twining was used in the manufacture of ordinary household baskets, hats, large trays for use in the preparation of *Wocas*, quivers, and gambling trays or baskets. The latter were used in the hand game to cover the hands of the operator while he was manipulating the sticks. The gambling trays were usually beautifully made and carefully decorated.

Decoration usually followed a zonal pattern based upon the insertion of a weft element of contrasting color. The light colored cattail was used for an almost white contrast with the brown of the tule. The reddish brown of the tule root gave a natural dark color while the tule dyed in mud gave a dark brown for contrast. Porcupine quills were used and generally gave a yellowish color pattern. The usual method of decoration is by the use of contrasting weft elements. Sometimes wrapped twining will be used to give a solid block of color on the outside to avoid the necessity of changing both wefts. Mrs. Jackson, while demonstrating the method of making a twined basket, used this and said that she was doing it because it was easier than substituting two new wefts. She called it "the lazy woman's method." I have never seen ordinary overlay or false embroidery used as techniques of decoration of Klamath baskets.

RIGID BASKETS

Twined conical carrying baskets were made from willow. If a better type of this sort was wanted it could be traded in from the Pitt River Indians. Barrett (1910: pl. 16, fig. 3) illustrates one of these baskets but the pitch of the weft is down to the left and the slope of the warps strongly suggests a coast basket. Along the coast the weft practically always sloped down to the left. In the same plate he illustrates two sifter baskets, one made from juniper root splints and the other from willow, and both have the conventional down to the right pitch of the weft. Visitors to the Klamaths from the coast usually brought baskets as courtesy gifts. This gift pattern would easily account for the introduction of the type of basket Barrett illustrates, I think incorrectly, as a Klamath specimen.

MATS

Mats were made of both the stalks of tule and cattail. The stalks were laid side by side as warps and then weft rows of twining were made using the twisted surface tissue of the tule as in the twined baskets. Sometimes a weft element of some other material would be used but not often. Mats for use on the houses, as has been pointed out, were sewed instead of twined. Small mats of various shapes were twined and used for household utensils, such as platters, trays, etc. The large mats were used as floor covers, to hang over the entrance in the houses entered from the ground level, and to cover the hatchway at night in the earth lodges. The same principle of manufacture was used in making the tule moccasins and leggings previously described.

RELIGION

The religion of the Klamath centered around the power quest. It was an activity that had to be actively undertaken by each individual. The adolescent seeking supernatural power, the prospective shaman, the war leader, in fact anyone undertaking any particular task was expected to secure a validation from supernatural sources through a quest for power. The individual adolescent went out alone at night into areas often fraught with real or surmised danger and went through a process of piling stones into a cairn-like structure that required him to spend some time in the area. The greater the danger and the more difficult the task the greater the chance for power. The most powerful shamans swam in the cold mountain streams or dived and remained under water until nearly unconscious. On the outcroppings of lava along the Sprague River near Kawumkan Springs are many of these piles of stones, records of many lonely quests for power (fig. 39-4). A short distance from this point is a small valley known as Long Prairie which was a favorite place for root gathering but because of the grizzly bears to be found there, the women very seldom dared go there. The closeness of this place to the area where there are so many of these rock piles probably lent a great element of danger to the visits of the searchers to this point.

Lieutenant Williamson (1857: 70) too saw many of these piles of stones and misunderstood their significance. He writes:

> Along the whole chain of Klamath waters we noticed in many places large stones laid one upon another, forming piles from two to six feet in height. Some of the party thought that these were to show the trail when the ground was covered with snow; but the vast numbers of them sometimes found within a few feet of each other, and their frequent proximity to trees, which could easily have been blazed, rendered this hypothesis rather improbable.

Since the party was at this time passing through the area where the Indians were gathering *Wocas* it is possible, as Dr. Stern has pointed out to me, that piles of *Wocas* were mistaken for piles of stones. It seems unlikely that these men would have confused the small units of *Wocas* pods with piles of stones, and I am inclined to think that they had observed stones piled by those in search of power. Spier (1930: 95–96) writes:

Power is sought in lonely spots on the mountains, in mountain pools, in eddies in the rivers, in all places where spirits are known to dwell. A boy is sent into the mountains on a vigil of several days, perhaps five, at puberty, that is, when his voice changes. He seeks power that he may acquire property, be a good hunter, become rich, a chief and be able to do all things that are difficult. (One does not need power to be a fisherman, for instance.) He must fast and not touch his hands to his face, but must use a scratcher instead. He must sleep without covering and warm himself only occasionally by a little fire. He runs about constantly throughout the night, piling rocks into high piles . . . and swimming in the mountain pools. He prays, calling loudly to the spirits, and finally gets an answer. At night he may see a spirit with blood flowing from his mouth; then he faints and when he wakes he too will have a hemorrhage. . . . He "nearly dies" before he secures a song.

It is possible that girls also seek power at puberty. Their dance at this time takes place at night; during the day they sleep in the brush or on the nearby hills. Then a song may be dreamed. One informant had it that they spend the night piling rocks like boys, returning at daylight, but I consider it very unlikely that a girl would be allowed to go unattended. Women well along in years, however, follow the regular practice, at least as to bathing in the spirit places.

The same method is pursued by the mourner, gambler, or shaman who seeks power, but swimming in the deep river eddies was more frequently mentioned in this connection.

SACRED OBJECTS AND PLACES

Objects like large rocks in any conspicuous place were often thought to be filled with power. A large rock in the Sprague River just downriver from Medicine Rock Cave was supposed to have curative power. It was from the nearness of this rock that we named the cave.

Caves, at least in some instances, were endowed with supernatural properties and incorporated into the body of folklore and myth. Medicine Rock Cave was believed to be the home of the culture hero, Kemŭ'kŭmps. Crater Lake held an important place in some of the myths. Adults would try to avoid passing near caves and certain rocks and children were warned by their parents to stay away from them for the inherent power was malignant or at least it could cause harm if not properly handled.

SHAMANS

Both men and women could be shamans. Spier (1930: 239) writes:

Shamans are then set off from the laity only in the possession of a greater number of powers. It is better to make the distinction by their acts: those who cure or practice weather control or clairvoyance, no matter how few their powers or the nature of their familiar spirits, are shamans. The quest is undertaken at any time of life, although usually at puberty. The most propitious times in the later life are at periods of stress, as in distress or on the death of an immediate relative. The formula prescribes fasting for a number of nights on the mountains, continually running about and piling up rocks, combined with diving into lonely pools, or following the latter plan alone by diving beneath whirlpools in the river or lakes which spirits are known to haunt. The suppliant loses consciousness and wakes to find himself on the shore bleeding profusely from the mouth and nose. He does not ordinarily have a vision, but success is manifested in a song heard in a dream on a night soon following. The dream experience is essential. So closely is the spirit identified with the song that but a single word indicates both. The song is the embodiment of the spirit, which hardly exists apart from it. The spirit is not the suppliant's guardian and later quests are not necessary for renewed experiences with it. Power may also come involuntarily, when a dreamer hears a spirit song. There is no obligation to accept, but resistance brings illness.

For study of the details of the shaman's performance the reader is referred to Spier's careful description. Here it will be sufficient to emphasize the importance of the position of the shaman in the Klamath community. His control over curing and the other services which only he could perform gave him a dominant position in the community. The payments he could exact for his services laid the basis for the shamans to become the wealthy members of the group and their greater possession of powers gave them a prestige value which they could well capitalize upon to gain and maintain leadership. An unsuccessful shaman received no payment. Spier (1930: 127) gives the payments made at about the time of contact as follows:

Fifty years ago the usual payment was twenty or twenty-five dollars in cash or an equivalent in clothing, blankets, beads, or horses. Ten or twenty fathoms of beads is the amount. Twenty dollars or one good horse secured his services for two nights. A man who has none of these gives a canoe, a suit of elk-skin armor, or even food, and if his only riches are marriageable daughters, he presents one of these to the shaman.

The shamans were thus a powerful and wealthy class. Their houses were the largest, owing probably to two factors: one, they had the wealth to build them, and two, certain dances were held in their houses thus making a large house necessary. However, it is likely that it was the command of wealth that made possible the large house in the first place. During the latter part of the precontact period, perhaps over a period of one hundred years, the power of the shamans was being challenged by the rise of a class of chiefs. At first headship or leadership was based purely on personal qualities which enabled one to secure a following and hold it. Then with the introduction of the ideas of wealth as a basis of chieftanship from the Northwest Coast a new type of class began to develop, that of chieftanship being validated by wealth, and this group began to challenge the shamans for leadership and prestige. The only point of referring to this development here is to call attention to the impact upon the Klamath Culture of a new influence from an alien source. Once the idea became established the trade at The Dalles with its cultural interchange and warfare for slaves, who could be traded for other articles of wealth, took on new significance. A new concept and the methods of its exploitation mutually stimulated each other and heightened the conflict with the old shaman class.

DISPOSAL OF THE DEAD

Cremation was the common practice of disposal of the dead. There is no evidence in the literature to support inhumation. Dr. Stern calls my attention to the myth type "Trickster seduces his daughter," in which Kemŭ'kŭmps feigns mental illness and requests that at death rather than cremate him they bury him at a shallow depth. Cremation sites were usually on some rocky point, but not always. Spier lists eleven for the entire Klamath territory. A pyre of green logs three to four feet high was built on the remains of previous cremations. The body is dressed with its beads and then wrapped in a mat. After being placed on the pyre it is covered with the property that the dead possessed. Relatives contribute also and lay a reciprocal obligation on the family of the deceased by their contributions. The tending of the fire is the duty of the men. After the cremation has been completed those who assisted purify themselves and their clothing by leaving it outside for several days while they swim or use the sweat lodge.

The house in which death occurred is burned with all the contents, even after the death of a child. This may account for the many houses destroyed by fire as shown by the archaeological record. On the death of a shaman his house is also burned with its regalia. This results in a great storm so that calm weather must be waited for to burn his house. Only an old woman may set the fire to it.

With the establishment of the reservation the administration made every effort to abolish cremation and quickly succeeded. Cremation sites have long since been destroyed by vandals who have worked them over for old coins, in particular, and other artifacts which had not been consumed by the funeral fire.

CULTURAL CONTACTS AND SOURCES OF CHANCE

By the end of the eighteenth century certain lines of contact with neighboring peoples with a more complex culture had apparently been established. It was not until early in the following century that these contacts were being exploited. The two main lines of contact with coastal influences were the Klamath River and north to the great trading and fishing center at The Dalles on the Columbia. There is no reason to think that the Klamath River was anything but a two-day source in influence for a long time, although not much thought has been given to this possibility in studies of the area (Reetz, 1949). The Columbia River at the end of the eighteenth century was in full contact with Euro-American trade materials in the form of metal, beads, etc., and some Plains influences such as the horse and the associated elements of gear. The articles of Plains dress, the horse, and the parfleche are probably derived from the Columbia although there is a slight chance of diffusion westward through the Northern Paiute. Trade with the lower Klamath River tribes was intermediate, while with the Columbia groups it was direct. In other words, it was the establishment of new contacts that provided the dynamic for the important changes of the last century of precontact Klamath culture. Looking forward for a moment it may be pointed out that the archaeological record shows an amazing conservatism and lack of change for a long period of time, then there occurs a marked change in the technology related to the economy of the area. We can only ask the question at this time, "Does this change mean that there was the stimulus of contact as a result of population movements in the area, or does it represent some kind of internal development, quite independent of any influence from the exterior?" If the former possibility is the correct one then there would be a situation somewhat similar to that of The Dalles contact of the nineteenth century.

LANGUAGE

The Klamath belong to the Sahaptin-speaking peoples who are found on both sides of the Columbia River east of the Cascade Mountains and extending northward in eastern Washington to the Interior Salish. They, along with the Modoc, their southern neighbors, thus represent the southernmost extension of the Sahaptin stock. The original distribution of the Sahaptin stock is at present unknown. Teit (1928) advanced the theory that the position of the Sahaptin was previously much further south than at the time of contact. Their historic position, according to Teit, was due to a continuing pressure on their southern flank by the Paiute. Ray, Park, and others (1938) have questioned this theory and presented evidence that would indicate that in the early nineteenth century there had actually been southward expansion of the Sahaptins at the expense of the Paiutes. However, the complexity of the linguistic situation in the Pacific Northwest is such that little is known of the patterns of linguistic distribution at any period long before the nineteenth century (Jacobs, 1937). Jacobs relies heavily on the normal processes of diffusion to explain the linguistic patterns of the coastal area, but there is still the problem of the original distributions and the later in-migrations which resulted in the subsequent diffusion even if Jacobs' arguments, persuasive as they are, are sound. The confusion of linguistic patterns for the Northwest indicates that over a long period of time there was a considerable shifting of populations, migrations of new elements, such as the Athapascans, and possible displacements of older groups. The peripheral areal position of the Klamath-Modoc in the Sahaptin cultural-linguistic area raises profound questions concerning the original distribution of the main Sahaptin stock. Voegelin, in his linguistic map of North America, suggests linguistic affiliations of Sahaptins that may indicate an original occupation far different from that characteristic of contact time. The Klamath, if Voegelin is correct, may be in a part

of an original area with the main body now located to the north. The information is not now available, and may never be, to give a satisfactory answer to the question.

SUMMARY

This brief survey of Klamath culture has indicated two clear-cut characteristics. First, there is a culture having a very neat adjustment to the marsh, riverine, vegetational resources of the area. Second, at the time of contact with Euro-American culture it had been in contact for sufficiently long periods with adjacent sources of cultural influences that the patterns so derived had become well integrated into the total overall culture. Consider these two characteristics in turn.

The examination of the economy of the Klamaths shows an adaptation to the particular ecological conditions of the area that bespeaks a long period of occupation. While there was no overall Klamath community, only a series of villages among which there were often raids, yet each group had a recognized home area to which it always returned at the close of the seasonal movements in search of the particular resource available at special seasons and places. The seasonal round of life was thus well established. The economic activities were aided by the development of a range of efficient tools and weapons as indicated above. When one considers the great reliance on the tule, which grows in such profusion along the quiet stretches of the rivers and marshes, for a large variety of products from food "plates" through game articles, clothing, and up to materials for houses, one cannot help but feel the closeness of these people to their environment, a situation that bespeaks a long and relatively undisturbed association. Earlier peoples in the Great Basin (Cressman, 1942) had exploited the tule for basketry, clothing articles, mats and other articles so that in the lake and marsh environment the pattern was well established for some thousands of years when the climate there was more moist and cooler. If the Klamaths had ever been hunters of large game, that pattern was largely lost to that of the exploitation of the smaller game and the fish of the rivers, lake, and marsh. One has the feeling of a people in a favorable but isolated habitat who through a long period of time worked out a simple but efficient adaptation to a fairly distinctive ecological potential. This first characteristic is like a finger board on a signpost pointing backward into the cultural past of the people.

The second characteristic indicates the Klamath as the receiver of cultural influences diffused from a variety of sources, but at the same time these influences came sufficiently slowly that they could be absorbed and integrated on the whole into the overall patterns of the group. Stern has spoken of the Klamath culture as exhibiting a pattern of a "range of permissive variation about a norm" (paper read at the American Anthropological Association meetings, Berkeley, 1950). While this is implicit to a certain extent in all cultures, it was explicit in the Klamath. Such a pattern as this would, of course, create a favorable psychological climate for the reception of new influences as long as they were not too divergent from the accepted patterns. Perhaps this attitude may have been derived from the long period of adjustment of these different local groups to the ecology described above, a situation in which a certain amount of variability of behavioral patterns would have been recognized as the price of survival. The question arises "When did these alien influences come into the Klamath area, and what causes or cause brought about the diffusion?" Spier has always made abundantly clear that the Klamath culture he was discussing was that in existence at the time of immediate precontact. However, one has often found that others have projected the patterns for this period back into an unknown distance into the past. Spier (1930: 233 ff.) describing the cultural affiliations of the Klamath writes:

> Taken as a whole, Klamath material culture is of Plateau type with strong leanings toward northeastern California. But their social and religious culture has a different aspect. While basically of the extremely simple Basin-Plateau type, social habits reflect the Northwest Coast, religious ones rather than those of northern California and western Oregon. . . .
>
> Social organization is extremely simple, and it is quite patent that as late as the end of the eighteenth century, it resembled that of the Basin and Plateau in every particular. Even now social stratification is weakly developed.

I think it is fair to infer from Spier's analysis that the basic stratum, as reflected in the technology and economy, in his "historical relief" (p. 234) is to be assigned to the Basin-Plateau. The question arises at this point as to what is basically early Basin and what Plateau. What part of the Klamath culture is derived from the southern Plateau, how much of it represents a parallel development in the two adjacent areas in response to the river resources of their environments, and how much of the similarity in the two is due to a derivation from a common source in considerable antiquity, or a combination of the latter two. At the time Spier wrote there had been no archaeology of any significance done in the Great Basin (Loud and Harrington's *Lovelock Cave* had been published in 1929, but Spier's field work was done in 1925 and 1926), none in the Klamath area, and almost none in the Columbia River area. We had thus been forced to rely on the analysis of the internal characteristics of the Klamath and Plateau cultures as shown from ethnographic sources to reconstruct the early base of these cultures. Extensive ethnographic study in the Great Basin has also been carried out since Spier wrote. The extensive archaeological research and the ethnographic studies in the Great Basin and areas adjacent to the Klamath have not in any fundamental way contradicted Spier's superb analysis of the Klamath culture. However, the

archaeological studies have provided a background in depth which provides a possibility for a perspective into which to fit both the fundamentals of the Klamath culture and those of the southern Plateau. The dated cave materials from the Great Basin (Cressman, 1951) give us an excellent picture of the early cultures there going back several millennia. Unfortunately, the archaeological materials from the Klamath area and the Columbia River region are from open sites so that the perishable materials are lacking in our inventories. Archaeological data for the Northern Great Basin show an antiquity of established occupation that is so far not matched by any site from the Plateau and this would tend to indicate an earlier date for the occupation of the Great Basin. However, the discrepancy may be due primarily to the accident of not having found so far any site of comparable antiquity in the Plateau. Recent work by Daugherty in Southeastern Washington and Cressman on the Columbia east of The Dalles, Oregon, indicates that there was some occupation of the southern Columbia Plateau not less than 9,000 years ago and possibly earlier. If the time relationships as now indicated should hold, then there is logic in looking to the early Great Basin as the source of the elements found in common, especially in the material culture of the Klamath and the southern Plateau.

These evaluations, for what they are worth, are based upon the additional sources of material in terms of their time and areal perspective available to me from archaeological and ethnographic data to which earlier writers did not have access. I shall come back to this point of relationships, now that the question is phrased, in a later chapter after discussing the archaeological record of the Klamath Lake area.

IV. MEDICINE ROCK CAVE

This cave is about four miles up the Sprague River Highway from Chiloquin on the west bank, site No. 5 on Map No. 3. Spier (1930: 14) refers to this cave as follows:

> . . . Komă'ĕksi is a site on both sides of the river south of Braymill, four miles from Chiloquin. There is a cave here which was the home of Kemŭ'kŭmps, the culture hero. Nearby is Wo'kstat, the site of the only first-fish rites among the Klamath.

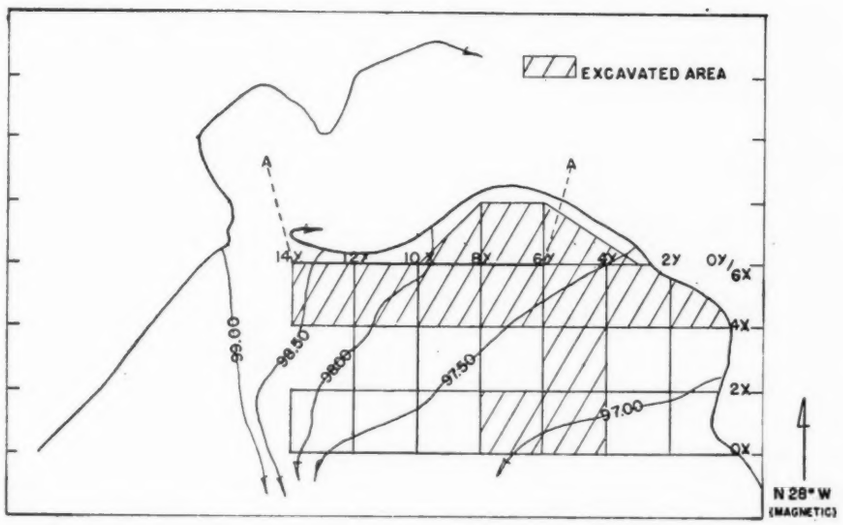
We named the cave Medicine Rock Cave because of its nearness to a large rock in the river just downstream which was supposed to have special supernatural power to cure illness. Miss Marian Pearsall, who was working among the Klamath during the season of 1947, told me that her informant, Mr. Herbert Nelson, who is about seventy years of age and living at Modoc Point, had said that this cave was made especially by the creator (Kemŭ'kŭmps) for himself because it was just opposite a very good fishing place. It leaked badly in the rain but Kemŭ'kŭmps did not seem to mind. The vicinity was supposed to be full of owls and the cave was sacred so that the Klamath would not go there, but they do now. I was told that the highway construction cut through and destroyed a cremation site here. Thus in the traditions of the Klamaths, this cave was sacred or perhaps it would be more correct to say that it was charged with power and was located in an area of ceremonial and mythological significance.

STRUCTURE AND FEATURES

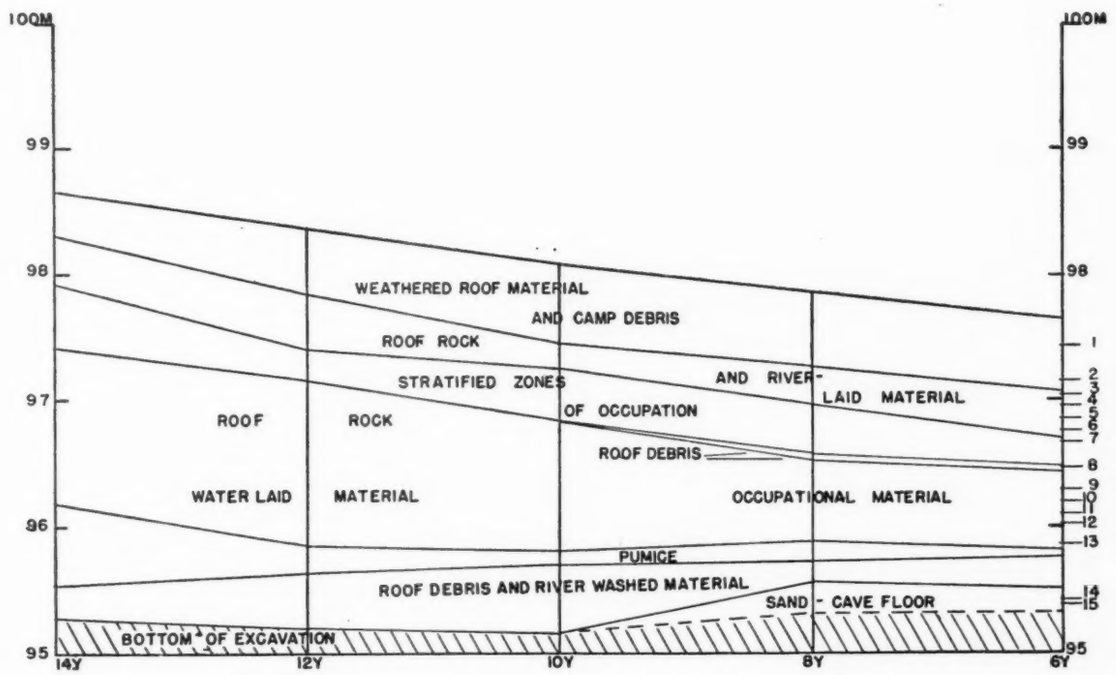
A series of lava flows (fig. 40-2) of unequal hardness, probably of Pliocene origin, may have dammed the river at the location under discussion. Excavation of the cave shows that before it was filled with natural deposition and occupational debris it extended down to the river. The face of the cliff now appears to have, at one time, been cut off by the river. The cave is just around the shoulder of rock, below the surface of the highway (fig. 40-2). The riffles in front of the cave are shown in figure 40-1. Figure 1 shows the area of the cave floor and the contours. An opening extends from just above the floor point 6X/14Y into a fissure in the overlying lava flow. The fissure is narrow and rises at a steep angle. I was never able to follow this to the other end, but there was probably an opening as there was usually a downdraft of air. The seepage of water during rains and the downdraft would bring rock and dust into the cave from above. This fissure probably accounts for the statement that the cave leaked for Kemŭ'kŭmps. Excavation showed that the river was in the cave intermittently for much of the early history of the filling. The current did not strike the cave directly but more as an eddy in the current formed where the river flowed against the bank just downstream from the cave. The water-laid deposits are all deeper in the downstream end of the cave. I was told that before the new highway was built sometimes in the spring during floods the outer surface of the cave was inundated. During the whole period of the occupation of the cave it was the rear part that was used, for the front part is lacking in occupational debris. This use pattern would tend to indicate that the front part was less favorable as an occupation site, possibly because of dampness.

EXCAVATION AND GEOLOGICAL STRATIGRAPHY

We first tested the cave in the season of 1947 in the hope that it would provide a cultural column into which could be fitted the materials from our house pit sites. There was evidence of occupation at the surface, ash that was fairly extensive and obsidian flakes, pieces of bones, and the usual debris of modern camps mixed with the aboriginal. In the latter were tin cans, pieces of beer bottles, .22 shells and such. In this level also were found glass beads testifying to the late aboriginal use. This top level was about .30 m. thick. This rested



PLAN OF MEDICINE ROCK CAVE
SHOWING CONTOURS OF CAVE AND EXCAVATED AREA



GEOLOGICAL PROFILE OF 6X ALONG A-A
SHOWING ALLISON'S GEOLOGICAL LEVELS 1948
NUMBERS ON RIGHT INDICATE OCCUPATION LEVELS 1947

FIG. 1. Plan of Medicine Rock Cave and geological stratigraphy. Scale in meters.

on a sterile layer made up mostly of weathered roof debris of approximately the same thickness. Level III started with a thin bed of charcoal and occupation debris. Thereafter there was a succession of alternating layers of occupational and sterile material to the bottom of the cave. Just above the bottom of the excavation in 1947 we uncovered a layer of pumice overlying one of sand. The latter contained the faint remains of a fire lens as shown by the discoloration and the pieces of charcoal found in it.

During the season of 1948 a small group continued the excavation of the cave, pushing the walls back further to the rear and carrying the excavation deeper. Figures 1 and 40-3 shows the face of the trench at the time in the 1948 season when the data were recorded upon which the profile in figure 1 is based. The wall stakes in the corner (fig. 40-3) mark occupation levels that could be differentiated down to the .5 m. mark on the stadia rod. The level markers in the corner do not indicate the spots of occupation that appeared in the lowest level.

The presence of pumice from the Mount Mazama eruption in the cave (it had been identified by Dr. Howel Williams of the University of California and Dr. Ira Allison of Oregon State College, independently) indicated that the cave should be examined by a geologist in view of the importance of the pumice as an age determinant. It was important to have expert testimony on whether the pumice was water-laid or wind-laid and whether it could be used to date the time of its deposition in the cave. Dr. Allison kindly accepted my invitation to examine the cave deposits. The levels identified on the profile (fig. 1) are those he distinguished. His description follows:

Description of levels of Medicine Rock Cave, by Dr. Ira S. Allison. Levels are from bottom to the top.

I. Bottom layer of cave is made up of river-laid sand. In the west end of the cave the sand is mixed with more stone.

II. In the second layer there is a mixture of debris from the roof and river washed material, with no true characteristics marking the layer. The pieces of roof debris are generally of a smaller size.

III. The pumice layer is almost completely continuous, being thin in the east end of the trench and thickening in the west end. The grains of pumice are of two sorts: mineral grains and glass grains. The glass grains are water-rounded and generally larger. The mineral grains (feldspar) are angular and show cleavage planes. This would indicate that the pumice sand had not been transported for very long, and as there is little mixture of the pumice material in succeeding layers, further proof is found to indicate that the deposition of the pumice was a distinct period. During this period we can conclude that a quantity of pumice was available to the river which wasn't before. This indicates the pumice must have been washed into the cave shortly after eruption and not a long period of time after the eruption because there exists only the one layer and it is not mixed with other debris.

IV. Above the pumice is another mixed layer of water-laid, roof, and occupation material. After the sandier layers were deposited, the river was not in the cave much, consequently it did not move the deposited material to any extent.

V. There is an additional section consisting of much blackened roof material with some finer materials located between larger pieces.

VI. Above this level are well stratified zones of intermittent occupation.

VII. Above this are roof rock and river-laid materials with a predominance of roof rock.

The later history consists of weathering of roof material and its consequent deposition upon the floor of the cave. So we can observe two weathering and depositional methods at work. During the first portion of time in the cave, the river deposited the greater amount of material in the cave which we can observe due to the predominance of sand in the stratified layers of the cave; during the second half of the cave history the falling roof rock made up the larger amount of deposition material. Most of the deposition fill slopes off to the east and as a last piece of information, the cave was very probably formed by river action.

Williams (1942: fig. 16) shows that the cave is on the periphery of the Mount Mazama pumice blanket in that area where the present depth after erosion is about six inches, but the fall of pumice farther upstream was of greater depth. Dr. Williams has written me that in his opinion there could very well have been a temporary damming of the river by the pumice and then, when the water broke out, the rise in the stream would easily have been likely to deposit the pumice in the cave.

There is no doubt that the pumice is water-laid, and, as pointed out by Allison, the distance of transport has been short and the deposition sudden. The pumice is clean, completely lacking in any twigs or branches or other kinds of materials picked up from a ground surface by a river in flood after rains. Whether Williams' explanation is correct there can be no doubt, as pointed out by Allison, that the deposition can be closely dated with the eruption of Mount Mazama, if not with the eruption itself. The evidence given by Allison above tends to suggest that the deposition may be dated at the same time as the eruption.

Radiocarbon dating has been developed since the excavation of the cave and we have a date now for the eruption of Mount Mazama, 6453 ± 250 years ago, based on four runs (Libby, 1952: 86). If we can accept the correlation of the deposition of the pumice with the eruption of Mount Mazama, then the occupation of the cave before the pumice was laid down must be dated before approximately 6,500 years ago. This date gave us evidence of the occupation of the Klamath Lake region by contemporaries of the hunters and gatherers of the Northern Great Basin to the east and south.

OCCUPATION OF THE CAVE

The area of occupation of the cave is centered on the point 6X/6Y, extending back approximately one meter

toward the rear and a like distance toward the front. Most of the occupation debris in the upper levels did not extend horizontally more than two meters from the ash lenses in the center. Overlying the pumice level was the thickest occupational debris, 25–30 cm. thick, extending from 4Y to 10Y. The entire deposit shows a series of naturally deposited beds intercalated with use levels in the center of the occupation area. In general, there is an alternation of sterile and occupation levels starting with the top level, No. 1 being the historic occupation level. Numbers 14 and 15 indicate evidence of occupation at those levels at 6X/6Y. In figure 40-3, the level between 0.6 and 1.2 m. on the stadia rod appears to be a continuous zone of occupation. But even here there is the separation of levels although the dark stain from seepage from the charcoal and debris overlying a sterile layer gives a misleading impression in the photograph. This section is in Allison's Level IV. It is clear that during the period represented by this occupation there was heavier use of the cave as a shelter for longer periods with shorter periods of disuse than was the case later. An interesting feature of this occupation zone is a level, 10 on the profile, Fig. 1, between 0.94 and 1.04 m. on the rod (fig. 40-3) which contains a heavy concentration of mussel shells. The significance in regard to food habits is not clear since there were mussel shells found in all the occupational debris, but not to the extent to which they occur here. Slightly to the rear of the 6X profile the occupation levels are somewhat thicker at the expense of the sterile debris. Another feature of interest in the history of the cave is that the heavy series of occupational materials above the pumice are practically level through their extent. The pumice shows this same character to 12Y when it thickens and picks up the characteristic slope. This might indicate that the period represented by the level occupational debris was a more favorable one than later for the use of the cave. The Mount Mazama eruption is dated at approximately 6,500 years ago in the Altithermal. A dry climate would cause less danger to the occupants from floods or weathering of roof debris.

SKELETAL MATERIAL

One of the features that is difficult to explain satisfactorily is an ash lens containing parts of the calvarium of a young child. The materials were found at 5.7X/9.25Y at an elevation of 97.16 m. which puts it just over one meter below the surface and well within the level, "Stratified Zones of Occupation." Fish bones and mussel shell fragments were found in the ash on which the human bones rested. Figure 40-4 shows the skull fragments *in situ*. No other fragments were found in spite of the most careful search. Since any estimate of age based on these bone fragments would be hazardous, probably the safest statement would be that the bones are those of a very young child, perhaps not more than two or three years old.

The bones are broken but not crushed, nor are they burned. The lack of any parts of any of the heavier long bones, their presence in the occupation level not far removed from the center of cave use, and the lack of any evidence of the ash lens having been disturbed by any later intrusion, all argue against a burial. The association of other bones of fish and shells of mussels certainly indicates one of two things, either (1) food use, or (2) some ceremonial performance such as offerings. I am of the opinion that whatever reason is given for the presence of the fish bones and mussel shells in the ash lens must also apply to the human calvarium fragments.

ARTIFACTS

The artifacts from the cave are grouped stratigraphically according to provenience from "Above Pumice" and "Below Pumice." This differentiation may seem unnecessary since of the total number of artifacts all but one, a large atlatl point (fig. 41-6), were found above the pumice, in the successive levels in the larger layer labeled as "Occupation Material" (fig. 1). A total of 44 classifiable artifacts were found. The mixture of debris from the historic level is excluded. This was clearly separated from the purely aboriginal by the underlying sterile layer. One large metate, made by grinding down one side of a large piece of basalt into a saucer-shaped depression (fig. 41-7), was immediately above the pumice.

PROJECTILE POINTS

Only twelve classifiable points were found. The details of our point classification will be given in the next chapter, but I shall list these according to the types assigned. Figure 41-3, 1–11, shows the points from above the pumice. See chart 1 (p. 412), for illustration of types. Numbers 3 and 4 fall into the 1A group and 1 and 2 into the 2A; 6 is type 4 and 9 is type 5; 5, 10 and 11 are the 6A type while 7 and 8 are 7A. All these points are relatively small, side or corner notched, and made of obsidian.

From below the pumice came the fine atlatl point (fig. 41-6) made from fine grained basalt. This is a 6A type. This point is unusual in that it is made from basalt. The vast majority of points in the Northern Great Basin at all periods are made from obsidian. However, under the pumice at Odell Lake (Cressman, 1948) basalt was used somewhat more extensively than elsewhere in this area. At Kawumkan Springs basalt was extensively used, when compared with the Northern Great Basin pattern, for chopper and scraper material. The fine work shown on this point is striking in view of the difficulty in flaking this material.

BONE AND ANTLER

Twelve pieces of worked bone and antler were found (fig. 41-4). Number 9 is an antler flaker, 6 a fish

gorge, 8 a pendant, 11 a needle. Number 8, which is broken, might possibly have been a head scratcher. Number 3 has smooth, polished facets and may have been used as some kind of an instrument for softening sinew or bark. The functions of the others are undeterminable. All have been worked and the sharp edges of some pieces indicate they could have been used as knives to cut up fish or open mussels.

SCRAPERS AND KNIVES

These have been grouped into two types, (1) a long flake retouched on the edges (fig. 41-2, 1–7) and (2) a group of large flakes of varying shapes and one, No. 5, which is definitely shaped throughout (fig. 41-1, 1–7). The first group consists of retouched flakes that would be useful in cutting up the fish and mussels used for food by the cave occupants. They have no diagnostic value. As will be seen in the discussion of the Kawumkan Springs artifacts, most of the scrapers from there are simply retouched flakes. Almost no bones of any mammals were found in the cave other than the worked ones described above.

Of the second group there are two roughly triangular-shaped end scrapers, 2 and 4, while 1, 3, 6, and 7 are, in my opinion, simply larger flakes, flat on one side and retouched more or less continuously around the edges. They, like the long flakes, are all obsidian. Number 5 perhaps should not be included here. It is tantalizingly like a Sandia, type A. It is within the size range, too. It could be classed in our type 11B, but it is rather large for that group. In view of the lack of specific pattern for the rest of the scrapers and knives, it is probably incorrect to include this specimen in with them. I am not convinced, however, that it is a projectile point.

DRILLS, GOUGES, OR GRAVERS

Five specimens (fig 41–5) fall into this group. Number 1 is a drill with flaring base. The others could have been used interchangeably as gouges or gravers. The sharp points suggest the latter use. The pendant or head scratcher (fig. 41–4, specimen 8) was probably worked by a tool such as these I have called gravers.

SUMMARY

Medicine Rock Cave was used intermittently from an unknown date before the eruption of Mount Mazama, 6,500 years ago, until historic times. Because of the dampness of the cave, perishable materials have disintegrated. One tiny fragment of partly burned matting was found above the pumice. From the fish bones and mussels found in the debris almost to the exclusion of mammal bones and the seasonal occupation of the cave as shown by the intermittent occupation, it may be inferred that the use of the cave was largely limited to the periods of the fish runs. Perhaps the Klamath practice of the first fish ceremony held with the upstream movement of the suckers near the cave actually had a long tradition behind it and was associated with the cave. A troublesome fact is that during the period of the main use of the cave the levels of occupational debris are thicker than the sterile ones. If the use was for a short period, it is hard to see how this relative thickness would occur. However, there may have been enough food and other debris left by the occupants in a short period to reach a greater depth than would the fallen roof debris and other natural materials over a much longer period of the year. One thing is certain, that the occupation was not continuous. This situation, the limited pattern of use of the cave, and the dampness made it impossible to secure a long cultural column in spite of the long use.

After a period of heavy, if intermittent, use, there is a period when the cave was unoccupied followed by the historic use. If we take the total fill at 6X/6Y above the pumice, a little less than .5 of the fill from the bottom shows intermittent occupation, then a little more than .2 is sterile and a strong .3 belongs to the historic period. Other things being equal (they never are), one would expect the depths with occupational material to build up more rapidly than the others. On the other hand, weather conditions or local qualities of the rock might cause a rather rapid deposition of sterile debris. It seems reasonable to assume that the pile of ash with the debris of modern campers, beads, flakes, .22 caliber shells, beer bottles, and tobacco cans, that make up the top layer at the profile, can be assigned to the 100 years or less of the historic period. If that is the case, then on the basis of the proportions of the fill for the occupied and the sterile layer we could assign a time period to the occupation layer of 4,400 years and 2,000 to the time of deposit for the sterile layer, based upon a date of 6,500 years ago for the Mount Mazama eruption, on the theory of equal rates of deposition. This suggestion of time spans for the different layers may be entirely wrong, but it is at least a way of approach to the problem.

The further suggestion is offered that the abandonment of the use of the cave may have been connected with the development of the belief that the cave was "sacred" and, as I pointed out above, p. 398, the Klamath Indians avoided the place. The final use of the cave by both Indians and whites as a shelter when fishing or hunting would correlate with the post-reservation days when the old cultural controls began to break down. Whatever the explanation of the use and abandonment of the cave, it is clear that the use contradicts the report that the Indians would not use it. Yet there was a time after long use when it was avoided, but then people came to it again. All that can be done is to raise questions to which there are no definite answers at present. A change in the behavior patterns of a people does not occur without reason, nor is a tradition that is in part

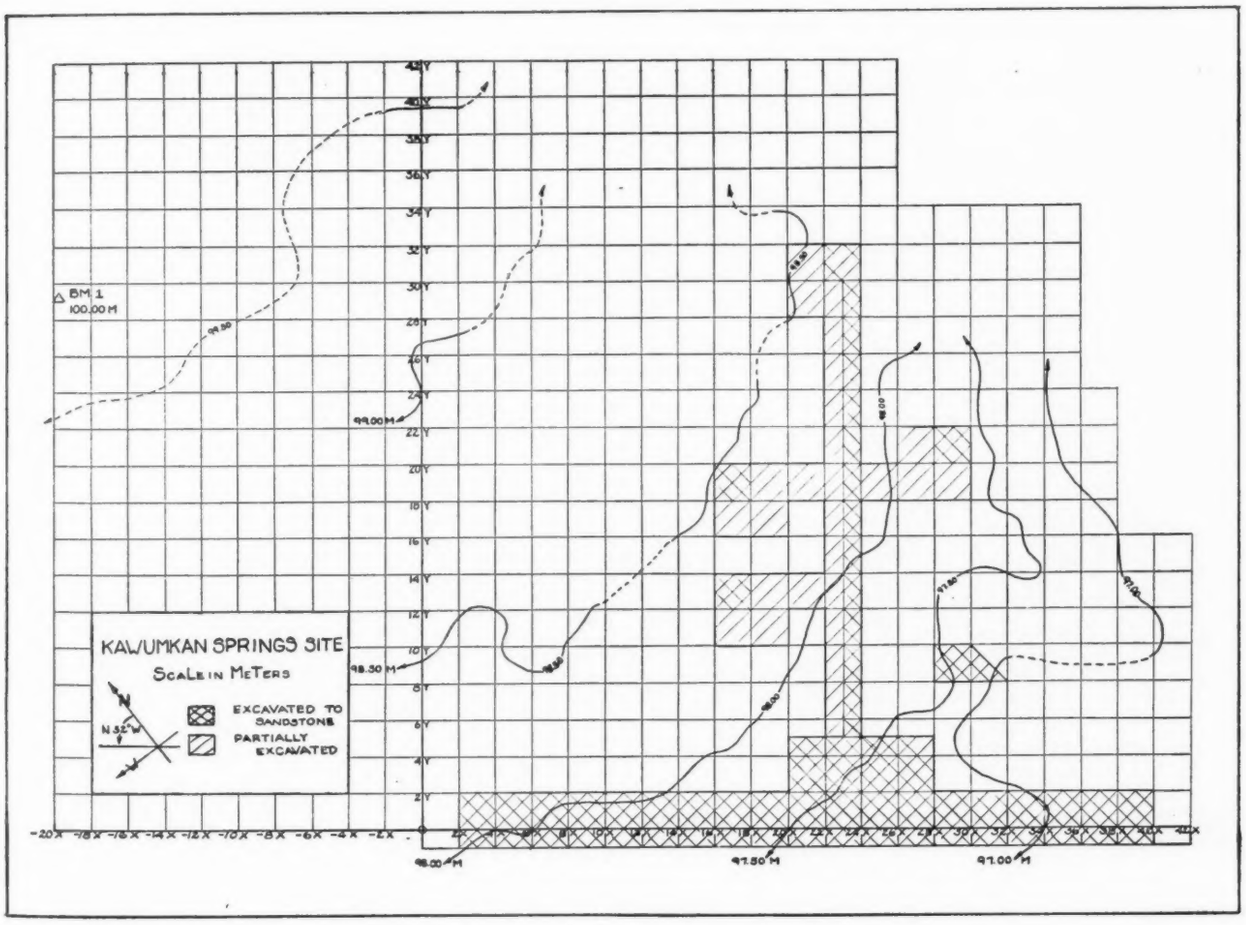
contradicted by objective evidence necessarily unfounded. Traditions have to have a beginning and perhaps the evidence from this cave has some bearing on this one of the Klamaths to which we have referred.

V. KAWUMKAN SPRINGS MIDDEN

GENERAL CHARACTERISTICS

The Kawumkan Springs Midden (fig. 42-1) lies in the roughly rectangular area formed by the Kawumkan Springs on the south, the Sprague River on the east, the low ridge of exposed basalt on the west, and the open meadow below the timber on the north (fig. 38-3). The midden ranges in width from 30 to 50 meters and is probably not less than 75 meters in length. The northern end extends out into a field under cultivation and the limits could not be determined by digging. However, the debris around the mouths of rodent burrows indicated the midden extended well out into the field, certainly as far as I have indicated. The map of the site (map 4) shows that there was a slight slope toward the Sprague River from the basalt outcrop. On the west side the midden was shallow because of the rock, while the greatest depth was in the area 28 to 40X between 0 and 2Y, and between 20 and 24X and 10 and 32Y. It is quite possible that the midden extended further into the meadow along the line of our X axis and that the eastern side has been eroded away by the Sprague River for an unknown extent. Large mortars and other artifacts have been picked up from the exposed bottom of the Sprague River at low water just below the sharp break in the midden, indicating that they have been dropped from the midden as it washed away. The location of the midden with reference to the Spring and the other features is shown in figure 38-3, 4.

Figure 2, Profile of Trench along 2Y from 2 to 40X shows that the base upon which the midden rested dipped slightly toward the river with a sharp break at 30X and then it disappeared at 32X. From this point on we were unable to establish the bottom of the midden because of the water table. However, midden material continued down into the area below the water table.



MAP 4. Kawumkan Springs site and excavated areas.

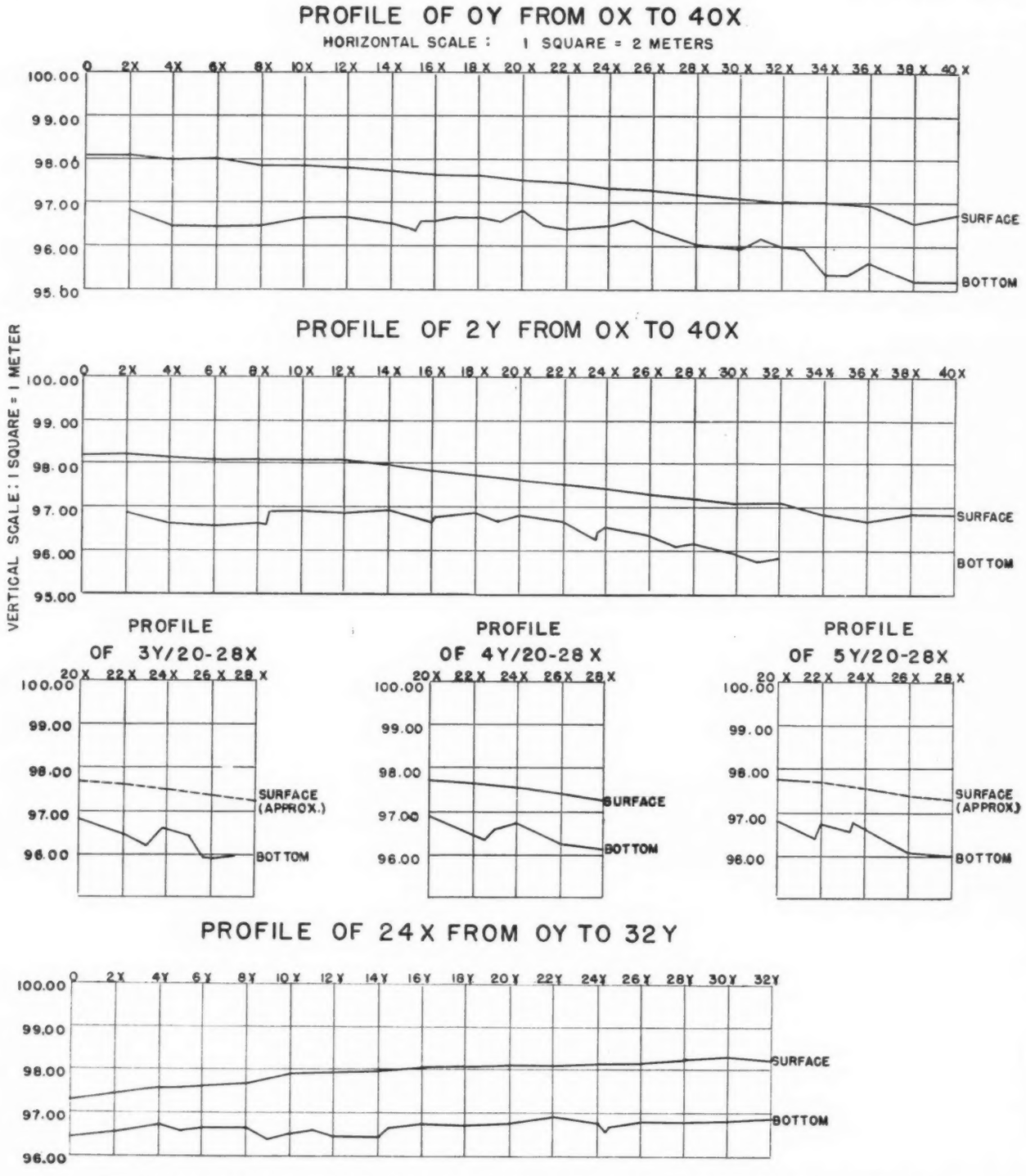

PROFILE OF 0Y FROM 0X TO 40X
HORIZONTAL SCALE : 1 SQUARE = 2 METERS
0 2X 4X 6X 8X 10X 12X 14X 16X 18X 20X 22X 24X 26X 28X 30X 32X 34X 36X 38X 40X
100.00
99.00
98.00
97.00
96.00
95.00
SURFACE
BOTTOM
PROFILE OF 2Y FROM 0X TO 40X
VERTICAL SCALE: 1 SQUARE = 1 METER
PROFILE OF 3Y/20-28X
20X 22X 24X 26X 28X
SURFACE (APPROX.)
PROFILE OF 4Y/20-28X
SURFACE
PROFILE OF 5Y/20-28X
SURFACE (APPROX.)
PROFILE OF 24X FROM 0Y TO 32Y
0 2Y 4Y 6Y 8Y 10Y 12Y 14Y 16Y 18Y 20Y 22Y 24Y 26Y 28Y 30Y 32Y

FIG. 2. Profiles showing surface level and bottom of excavated trenches at Kawumkan Springs Midden.

The formation on which the midden rests consists of a badly disintegrated sandstone (fig. 43-2, 3, 4) and for about the first 14 meters of the trench between 0 and 1Y, there is pumice resting on the sandstone with pockets of indurated fine volcanic ash and under that diatomaceous deposits. Figures 43-1, 42-4 illustrate these characteristics. The pumice is furrowed by small channels generally directed downgrade toward the

present Spring. At first these were thought to be rodent holes, but closer examination of the cross sections and then the carefully uncovered surface showed that they were not the round burrows of rodents. The question then rose whether these could be old flow lines of springs at that level when the water table was higher. A careful examination was made of the shore line of the present Spring and numerous small springs were found that made the same kind of furrows. Then a level was hastily run across to what appeared to be the marks of an old spring on the slope above the present large spring from which the Lalo family gets its water for household purposes. There was a difference of about six centimeters between the levels of the upper end of the furrows in our trench and the old spring. In view of the haste with which the level was run, it is quite reasonable to hold that the levels correspond.

Kawumkan Spring is made up from the discharge of a great number of springs. There is one with a very considerable flow, the Lalo one referred to above, just above the present surface of the water. Then there are numerous smaller ones around the south side of the Spring toward the Sprague from the Lalo Spring. Numerous sand boils contribute their part at the portion near the outlet to the river. Others, how many is not known, discharge from the bottom into the Spring, and at least one of these is quite large. From the shore the larger ones may be seen where the water boils up and from a boat the smaller ones may be observed as they boil up the sand on the bottom, but are too small to disturb the surface of the water. When the Sprague River is full with the spring runoff, it backs up into the Spring, making the water cloudy. When the river drops the Spring becomes crystal clear within a day or two.

The temperature of the water of the Spring is constant at approximately 52 degrees Fahrenheit. This keeps it cool in the summer and because of the heavy discharge into the Sprague in winter, it, with other springs which are somewhat warmer, keeps the Sprague River below the confluence open for the most part of winter.

The basalt exposure consists of scoriaceous lava and at one time probably covered the area. Faulting and subsequent erosion have removed most of it. It dips sharply toward the Spring; then large boulders of it appear on the opposite side at the narrow portion (fig. 38-3). The Indians took advantage of this and filled in the narrow part with rocks to further narrow the channel, through which the fish had to pass, to make a place for spearing them. Faulting, probably along the Yawhee fault line, provided the channel for the Sprague in its long meander up through the meadows and back by the midden, and also accounts for the dip of the sandstone toward the river. Then a smaller transverse fault across the larger one accounts for the dip toward the Spring and the springs themselves along the fault line

HISTORY OF THE MIDDEN

At the time of the signing of the treaty, the headman, Lalo, was recognized for this group. Gatschet (1890: ixxv) records his drawing rations for twenty-three people on October 30, 1877. A grandson now lives on part of it, holding it in trust. This grandson told me that his grandfather had told him that his people did not live in the houses, the remains of which are found on the midden, but back on the hill above. The midden houses, according to the elder Lalo, were used by the "old people" long before his time. In 1915 a house was built by the Lalo family on the ridge running up from the midden. In the twenties the house presently occupied by the grandchildren was built and the older house abandoned. The midden itself had been fenced in and was used as a corral for cattle. It had also been used as a playground by the children and traveled over by fishermen. This later use of the midden accounts for some of the historic materials found in the fill of the house pits. The midden is cut diagonally by a property line and the portion south and east of that is held in trust by Leonard Long. This is the northern extension of his property which starts at some distance south of the Spring. Thus, at present, both the Lalo and the Long families control the Spring, each having a part. The fence originally built along the property line has disappeared and an arm gesture indicating about where the boundary is is not very accurate. In general, the areas of control are indicated on our map of the house pits. In excavation of Lalo-II we thought we had found a house post, but the character of the cut surfaces indicated a steel axe. Remembering the fence, we then projected a line from that post and the corner boundary and dug along that line to find whether another post was there. We soon found one and then going the same distance out along the line, with a little digging, we found another. The original fence had been cut down at the ground level and the debris from the corral and the deposit of trash from the yearly growth of weeds had buried them.

At present there are cottonwood trees along a portion of the Spring at the end of the midden and many more on the other bank. Along the Sprague there is a heavy growth of willows. The rest of the midden, except where the basalt outcrops, is covered with a heavy growth of weeds and bunches of wild rye.

METHOD OF EXCAVATION

GRID CONTROL

A bench mark with an arbitrary elevation of 100 m. had been established on an outcrop of the basalt during the 1949 excavation of the house pits. The same bench mark was used for our controls on the midden excavation. Then a grid was laid out on the midden to correspond to the general pattern of the site. The line of

the X axis runs S 32 degrees east from the 0X/0Y point and the Y axis at right angles extends along a line N 58 degrees east. This gave us a plan of trenches at right angles to each other which would cut through the maximum measurements of the midden. Then stakes were set at each 2 m. interval. The surface levels were read by transit at each stake and the contours imposed on the grid pattern from the readings and inspection on the site. The grid pattern and the excavated areas are shown on map 4, while the depths of the excavations are shown in figures 2–4.

METHOD OF EXCAVATION

An exploratory trench 1 m. wide was dug rapidly from 2X to 40X between 0Y and −1Y, to determine the depth of the deposit and whether there were any signs of either geological or cultural stratigraphy along the face of the 0Y axis. The section from 0 to 2X was used for entrance into the exit from the trench. This trench was not taken down by levels since it was important to get the site opened. Elevations and horizontal measurements were taken on any artifacts or features found *in situ*. Since there was no evidence of either geological or cultural stratigraphy, it was decided to continue the excavations by arbitrary 40 cm. levels. The first trench was 1 m. wide and the deposit was removed by working back the 40 cm. face from the front of the trench. Two students worked together in each 2 m. section. The face was cut back with trowels and then shoveled into sifters, carried out, and sifted. One section was checked to determine the relative effectiveness of working with trowels and then shoveling out the back dirt as compared with the sifting method. The count of the artifacts showed that there was a slightly higher recovery, especially of very small pieces, with the sifting method, so that was then resorted to. However, toward the end of the dig, because of the pressure of time, some of the deposit was shoveled directly into sieves and then sifted. The uncovering of anything *in situ* immediately brought the trowels into use.

All artifacts from each level and square were put into labeled bags and turned in either to me or to a supervisor who signed them and then issued a new bag. In this way the record was kept clear. With the exception of one small area, all flakes were saved. The purpose of this was twofold, (1) to determine whether there was any preference for any particular kind of stone for tools, and (2) to use the concentration of flakes as evidence for the use pattern of the midden.

After completion of the long trench from 2X to 40X and between 0 and 2Y, the section between 20 and 28X and 2 to 5Y was excavated. Then a trench between 22 and 24X was started at 5Y and run to 32Y. After this trench reached the bottom of the first 40 cm. level, it was clear that it would have to be narrowed if we were to reach the bottom in the time we had available. Therefore, this trench was narrowed to 1 m. between 23 and 24X. While this trench was being dug, other parties were put to digging test or stratipits. These started out 4 m. square but after going down 40 cm., these were reduced to 2 m. square and then this square was carried to the sandstone. All except one of these were then connected to a depth of 40 cm. with the main trench (figs. 3, 42-2).

At the close of the excavation all trenches and pits were filled in by a bulldozer and the site restored to its original level.

USE OF LEVELS IN PRESENTING RESULTS

For the presentation of the results, the deposit is reduced to four levels of 40 cm. each and numbered I to IV from top to bottom. These levels are modified from the arbitrary levels of the excavation in the following way. Since the deposit sloped toward the river, both on the bottom and at the surface, the arbitrary levels would not run the full length of the deposit until the depth was sufficient at the uphill end to be below the surface at the downhill end of the trench. Therefore, all levels were adapted to the slope of the ground and ran as follows: I ran from 0 to 40 cm., II from 40 to 80 cm., etc. There were four levels with a small pocket near the end of the trench between 23 and 24X and 0 to 32Y that extended into Level V, but the area is so small that for all practical purposes it may be omitted as having any significance in the results.

The validity of this procedure of handling the contents of the midden for analysis may well be questioned. It assumes that our levels, which correspond to the general slope of the surface, represent the continuing or use-surface of the mound during the occupation. The question of validity is important since the use of the four levels determines our conclusions concerning the developing phases of the life of the site. The surface slope along 0Y starts at 6X but two meters further in on the site, at 2Y, the break starts at 14X. In both cases it continues to 40X (fig. 2). There is a drop of about one meter in 34 along the 0Y profile. Along the 24X profile from 4 to 16Y there is a rise of about 50 cm.; then the rest is practically level (fig. 2). The bottom of the excavation on the sandstone along this profile is essentially level. The main problem is concerned with the portion of the 0–2Y trench from 2–40X and a small area in that part of the excavation where the trenches 22 and 24X from 5 to 32Y met the base one at right angles to it.

There are certain features of the topography of the site and the relation of the river to it to keep in mind. As has been pointed out, the site lies between a basalt outcrop on the west and the river on the east. Both features limited the extension of the occupation area laterally and the spring fixed the limits on the south. The only direction for expansion was toward the north and the further it was extended in this direction the

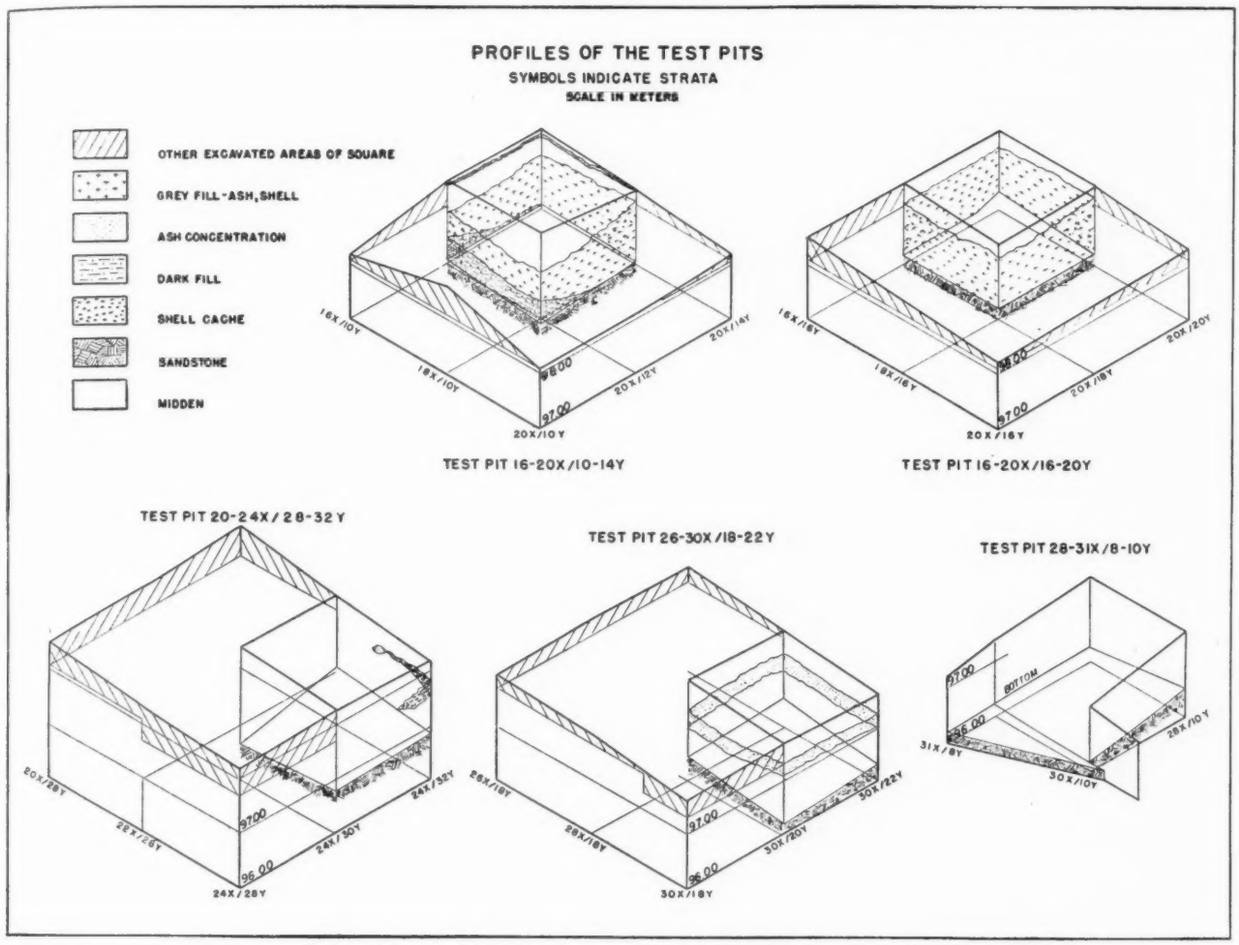


FIG. 3. Profiles of test pits, Kawumkan Springs Midden.

greater the distance from the spring. It is quite possible also that the channel of the river was further to the east than now and that the confluence of the river and spring was further out in the meadow than is now the case. But what we have to do is analyze the artifacts from the site as it now exists and rest the study on the internal conditions of the midden. Unless the sections, which may have been destroyed, would have changed the probable pattern of use they can be ignored as affecting our problem in any fundamental way. On the basis of the evidence we have and the small amount of midden that was probably destroyed, it is quite justified to assume that the parts that have disappeared would not in any significant way alter what we have inferred to be the use pattern of the site.

An examination of the site map (4) will show a very shallow slope as a convexity extending in from the direction of the junction of the spring and the river. It is possible that this slope is due to cutting by the river in flood and surface wash from the basalt outcrop above. It may be that there has been some subsidence here with the closer approach of the river to the site. The water table at the southeast corner of the site at the time of our excavation extended above the bottom of the artifact bearing level. It would hardly seem plausible that, had the water table been at the same level during the period of use of the site as it is now, the occupants would have lived on that portion. Thin lines of sedimentation at the end of the trench showed that the river flooded that area from time to time as it does now.

The internal evidence in the form of artifacts strongly suggests fairly even occupation of the site, at least as far as our sample represents it. The distribution of fire broken stones used as evidence of occupation areas shows very little variation from beginning to end when adjusted for the different amounts of dirt excavated. There appears to have been one place of concentration around 22–24X and 5Y and another somewhat farther out the center trench toward 32Y, roughly around 24Y. In the top level the distribution of these specimens was pretty uniform over the excavated area. The distribution of flakes tends to conform to this pattern.

Another piece of evidence is the "kitchens" (fig. 4). This profile shows that the surface or a line drawn along the tops of these features closely corresponds to the surface slope.

Handling the analysis of the materials by arbitrary levels from a datum would have to be based on an assumption that seems insupportable on any grounds of logic, namely, that the occupants started to use only the lowest levels and then moved up the slope, constantly maintaining a level surface. It would also result in absurd use of the stratigraphic principle and equally absurd inferences. Level III, which would be from 80 to 120 cm. at one end of the trench, would meet the surface at the lowest end and be considered of the same age as Level III when related to the surface; yet it obviously is not, unless we assume that the occupants kept restricting the area of use in order to maintain arbitrary levels of surface.

There is the possibility that the peripheral areas, especially in the low part, might have been a dump heap for the center area (fig. 5). This does not seem plausible on the basis of the location of one "kitchen," and the nature of the artifacts found in the low area. One of the largest house pits, Long-4, was located in the lowest area of the site and was cut on the southern perimeter by our 2Y profile at about 36–38X. Had the site been in a ceramic area, there would have been a good chance of determining the nature of the use of the mound but since our analysis has to depend almost entirely on stone, we have to operate within the limits imposed on us by these artifacts which are so much less useful than pottery as indicators of change and relationships.

The lack of geological stratigraphy in the site posed still another difficulty.

We, therefore, on the basis of the logical analysis of the situation from detailed field study and the internal evidence from the artifacts, felt justified in adopting the method of analysis by levels from the surface. The results, unless they are an artifact, too, generally confirm the reasonableness of our approach. Projectile points, grinding tools, and the kitchens show that there is a series of differentiations that are correlated in the main with various levels as we have used them.

METHODS OF ANALYSIS OF ARTIFACTS

All artifacts which are numerous enough have been analyzed in terms of percentages by levels. There occur what we call "original" and "adjusted" numbers and percentages in each case. The original represents the actual number of artifacts while the adjusted number and percentage are the number and percentage there would have been had we excavated the same amount of dirt in each level, based on the assumption of the same artifact concentration. It was pointed out earlier (p. 384) that Level II was used as the control. Adjusting the figures reduced those for Level I since there was more dirt removed at this level because of the methods of excavation. Levels III and IV had their artifact count increased by "adjustment." In this manner the amount of containing fill was held constant as a variable affecting the artifact count for any level. The results by "original" and "adjusted" counts appear in the tables and graphs.

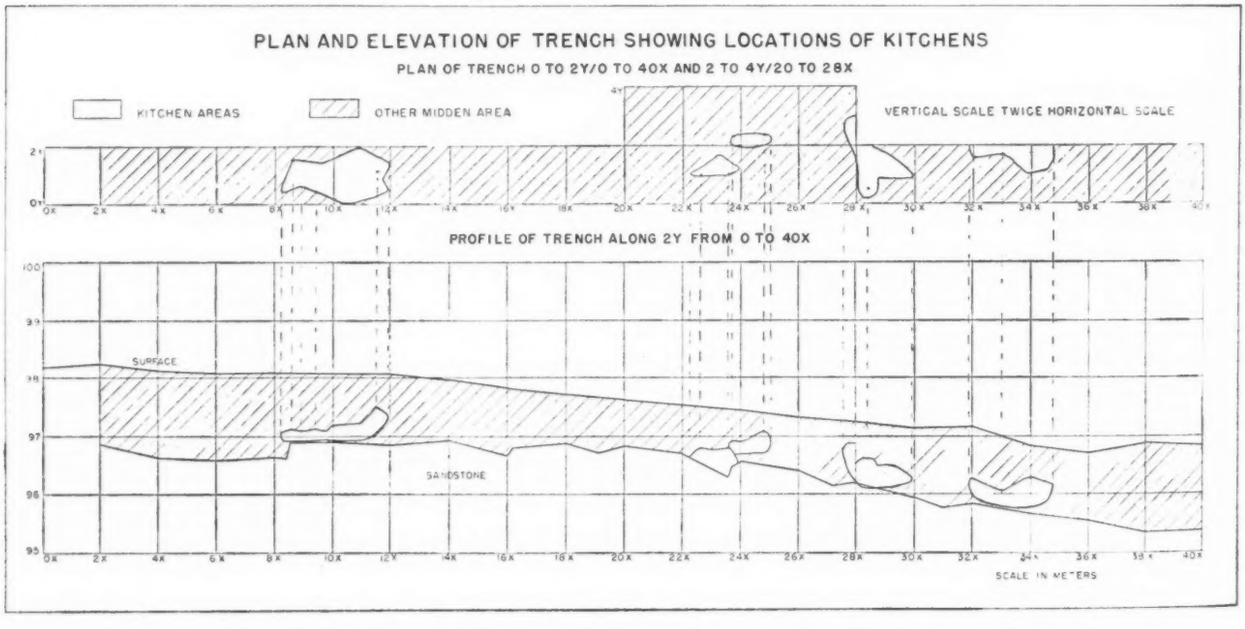

PLAN AND ELEVATION OF TRENCH SHOWING LOCATIONS OF KITCHENS
PLAN OF TRENCH 0 TO 2Y/0 TO 40X AND 2 TO 4Y/20 TO 28X
KITCHEN AREAS
OTHER MIDDEN AREA
VERTICAL SCALE TWICE HORIZONTAL SCALE
PROFILE OF TRENCH ALONG 2Y FROM 0 TO 40X
SURFACE
SANDSTONE
SCALE IN METERS

FIG. 4. Plan and elevation of trench showing locations of "kitchens," Kawumkan Springs Midden.

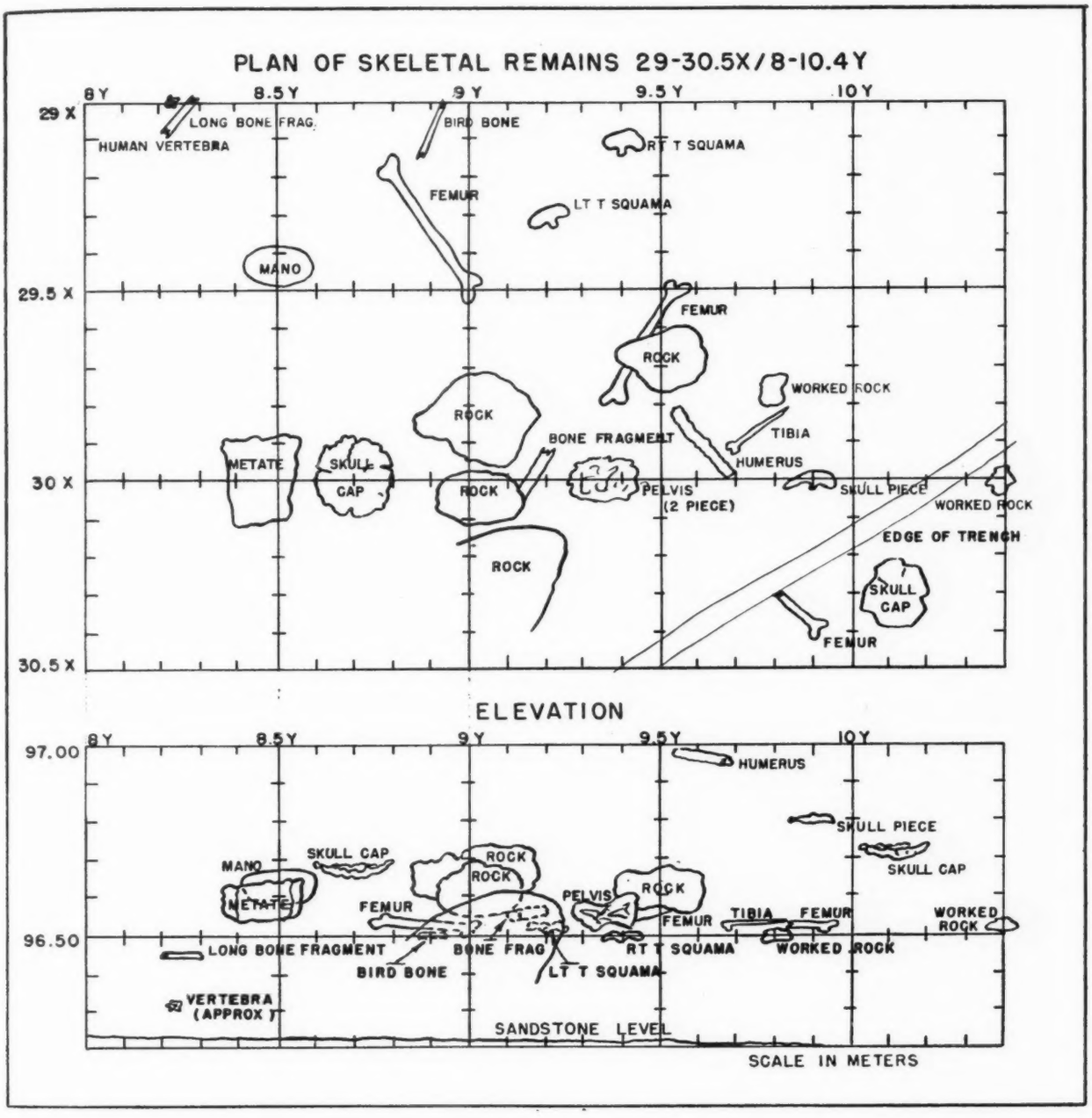


FIG. 5. Plan of skeletal remains and associated materials at 29–30.5X/8–10.4Y, Kawumkan Springs Midden.

A number of our analyses show the variation by levels where the relation of a single artifact type is being studied, and others show both this kind of variation and variation within levels by different specimens such as bones of food animals where it is desirable to make this type of comparison. In each case the referent is the average per cent and value appears as a plus or minus deviation in percentage points from the average. One can see at a glance whether a particular entry for a given level is above or below the average for all levels or, in the case of the analysis within a level of comparable data, the variation from the average for the level.

Summarizing, the materials are presented by 40 cm. levels measured from the surface. Level II is taken as the control level and all others are adjusted to it by multiplying them by an index based upon the ratio of the cubic contents of the level to those of Level II, and thus the influence of the amount of dirt excavated in

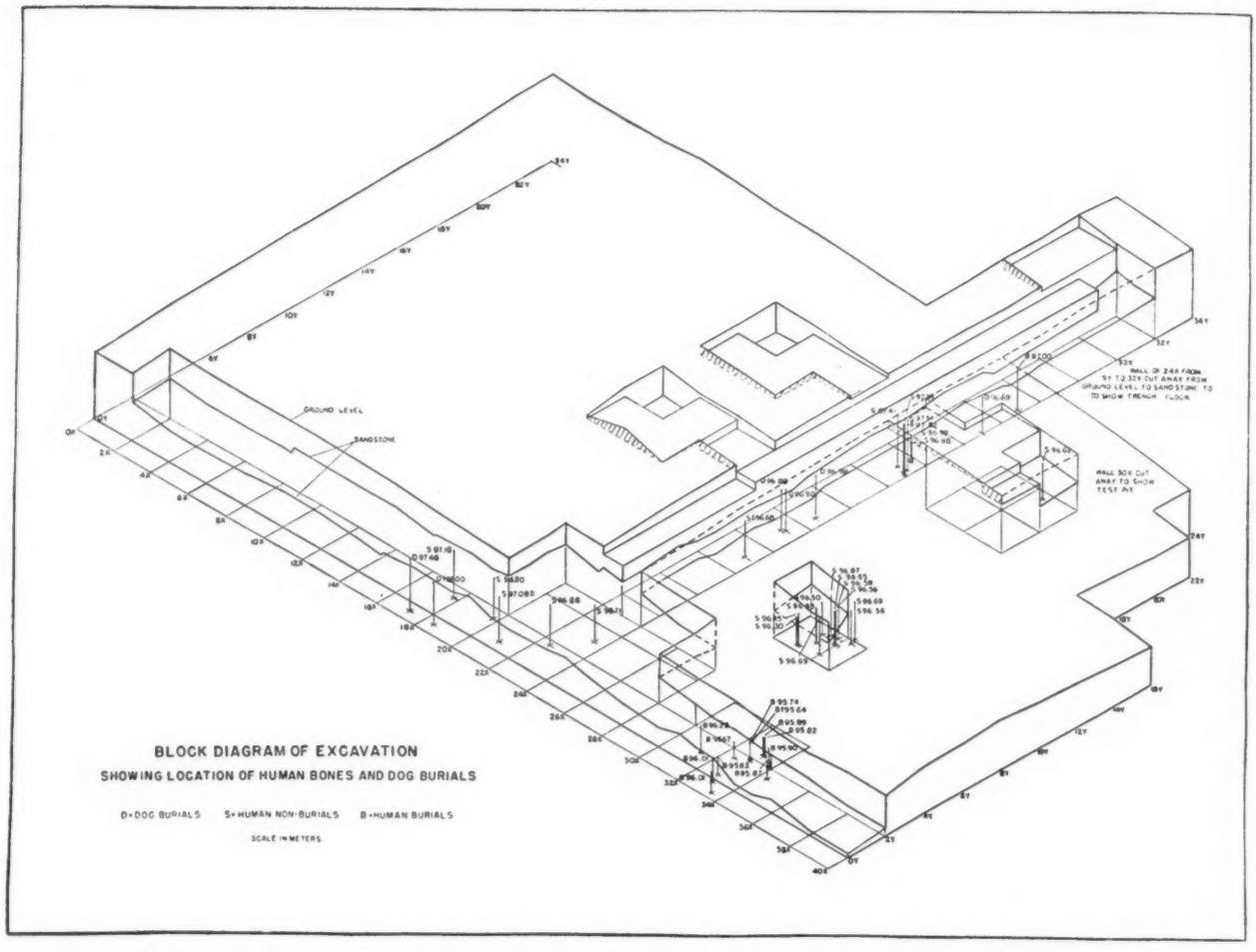

BLOCK DIAGRAM OF EXCAVATION
SHOWING LOCATION OF HUMAN BONES AND DOG BURIALS
D-DOG BURIALS S-HUMAN NON-BURIALS B-HUMAN BURIALS
SCALE IN METERS
GROUND LEVEL
SANDSTONE

FIG. 6. Block diagram of excavations showing location of human bones and dog burials, Kawumkan Springs Midden.

any level as a variable is held constant. All results capable of statistical analysis are presented in both "original" numbers and percentages and "adjusted." Variation in time and in types within levels is presented in the form of deviation in percentage points from the average for the series and units of occupation under study.

ARTIFACTS FROM THE MIDDEN

PROJECTILE POINTS

A total of 374 projectile points was found. The adjusted number is 449. Chart 1 shows the types and the number and percentages by both original and adjusted counts for each type by levels and for each level

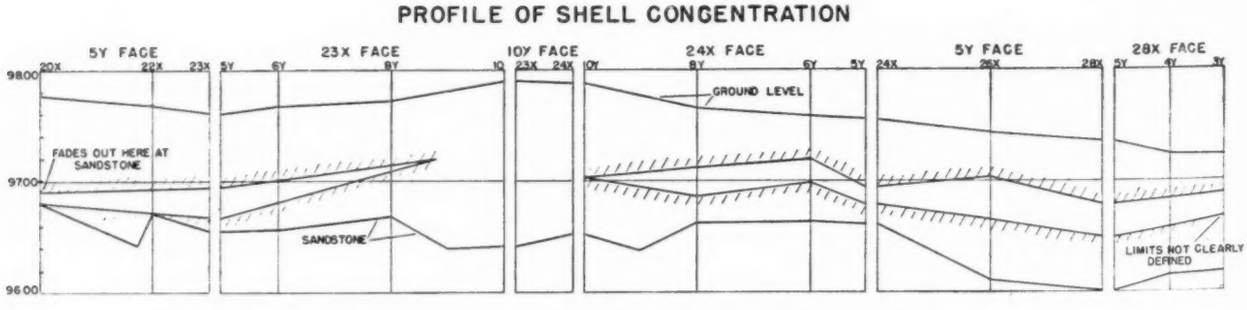


FIG. 7. Profile of shell concentration, Kawumkan Springs Midden.

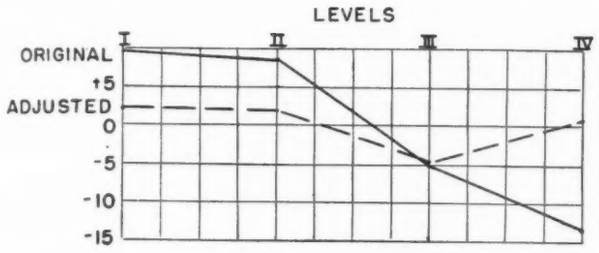


FIG. 8. Fire broken stones by Levels, Kawumkan Springs Midden.

by types. Figure 10 shows the percentage of each type by adjusted count by levels. Level V is not included in figure 10 for the totals series since it contained but four points by the original count and nineteen by the adjusted. These appear in the "total" for the series.

METHOD OF CLASSIFICATION

Basic to our method of classification is the assumption that a series of patterns existed in the minds of the people and that individuals tried to approximate these point patterns in their manufacture. Rather than take a point as the "type" we have tried to abstract a pattern from the variant forms which seemed to be generally alike. This is the ordinary operational procedure of the ethnologist in the field. It is, however, an effort to get away from the old taxonomic system of the use of a "type" form, and bring our procedure into line with normal field methods. This procedure also recognizes the element of variation in the products due to differences in skill, haste, quality of the stone, and other conditions, and avoids the semantic problem of what to name specimens that approximate a "type" form but do not conform to it. We asked ourselves, "What seems to have been the form of the point that the manufacturer had in mind when he produced these?"

Our procedure was as follows. All points were put on a table indiscriminately by levels. Then they were sorted, first by me, into a series of groups that appeared to me to have a general likeness within the group and at the same time to be different from any other group. After this was done a second person was asked to check my ordering and make any changes he felt desirable. After he completed his examination a third person was asked to check the series and make any changes he felt should be made. The second and third examinations produced very slight changes and where there was any difference of opinion they were resolved by discussion until all three of us agreed on a defensible system.

Once this agreement had been reached, then we asked the question, "Granted that these are justifiable groupings, what was the pattern which guided the worker in shaping the points in each case?" In other words, what was the ideal pattern for which the individual points are the production (behavior) units (pattern)? The pattern which we inferred appears in the drawing in each case on the charts. For purposes of analysis these patterns represent our types but probably in no case is any point exactly like our drawing. In order to show what points we have classified under each category, the points were grouped by levels and photographed. Figure 45, 1–5 shows the range of specimens by categories for each level. This method of complete illustration will permit anyone who so desires to make any kind of classification he wishes. It provides a clear record of our system and the whole range of points with which we worked.

Obviously the basis of our classification is form. However, it was clear that size and proportion entered as differentiating features with certain groups. When those points that were clearly different in size from the others were separated, it was found that they could be readily grouped. These fall into our series 1–5. On the basis of form alone, 6A could be confused with 1 and 6B with 2 but when size and proportion were also considered there was no confusion. Certain groups have been broken into A and B subdivisions. This has been done because there seemed to be an observable, but minor, difference. It seemed wise to do this because once separated they can be united and treated as units whereas if they are grouped, they cannot be separated. It may be that the differences are of no significance as far as the maker was concerned, but they were observable to us and so we used them.

The quality of workmanship on most of the points is definitely poor. A few stand out as exceptions as an inspection of figure 45 shows. In general, the smaller points, Types 1–5, show superior workmanship over the others. These points appear late in the use of the site; this may be of some significance. The first specimen in Level III, Type 7A, is an excellently made specimen. This was used to help kill the individual represented by the skeleton, 11–222, and since the other weapon was a long bone point typical of the Lower Klamath Lake

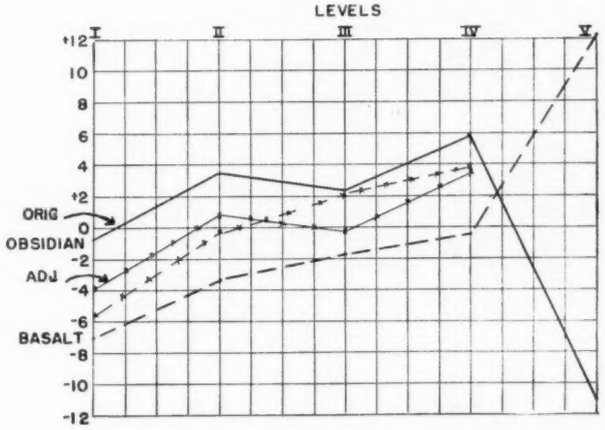


FIG. 9. Flakes by kinds of stone by Levels, Kawumkan Springs Midden.

TYPES		LEVEL I NO.	%	LEVEL II NO.	%	LEVEL III NO.	%	LEVEL IV NO.	%	LEVEL V NO.	%	TOTAL NO.	%	TOTAL NO.	%
1A	ORIG.	9	6.8	9	7.9	5	5.6	1	2.7	0	0.0	24	6.4	1-34	9.1
	ADJ.	8	6.4	9	7.9	6	5.1	2	2.7	0	0.0	25	5.5	35	7.8
1B	ORIG.	9	6.8	0	0.0	0	0.0	1	2.7	0	0.0	10	2.7		
	ADJ.	8	6.4	0	0.0	0	0.0	2	2.7	0	0.0	10	2.2		
2A	ORIG.	11	8.3	4	3.6	2	2.3	0	0.0	0	0.0	17	4.5	2-30	8.0
	ADJ.	10	8.0	4	3.6	3	2.6	0	0.0	0	0.0	17	3.7	29	6.5
2B	ORIG.	8	6.1	5	4.5	0	0.0	0	0.0	0	0.0	13	3.5		
	ADJ.	7	5.6	5	4.5	0	0.0	0	0.0	0	0.0	12	2.6		
3	ORIG.	4	3.0	1	0.9	1	1.1	0	0.0	0	0.0	6	1.6	3-6	1.6
	ADJ.	4	3.2	1	0.9	1	0.9	0	0.0	0	0.0	6	1.3	6	1.4
4	ORIG.	3	2.3	0	0.0	0	0.0	0	0.0	0	0.0	3	0.9	4-3	0.9
	ADJ.	3	2.4	0	0.0	0	0.0	0	0.0	0	0.0	3	0.7	3	0.7
5	ORIG.	2	1.5	1	0.9	1	1.1	0	0.0	0	0.0	4	1.1	5-4	1.1
	ADJ.	2	1.6	1	0.9	1	0.9	0	0.0	0	0.0	4	0.9	4	0.9
6A	ORIG.	9	6.8	5	4.5	2	2.3	0	0.0	0	0.0	16	4.3	6-22	5.9
	ADJ.	8	6.4	5	4.5	6	5.1	0	0.0	0	0.0	19	4.2	25	5.6
6B	ORIG.	0	0.0	6	5.4	0	0.0	0	0.0	0	0.0	6	1.6		
	ADJ.	0	0.0	6	5.4	0	0.0	0	0.0	0	0.0	6	1.3		
7A	ORIG.	6	4.6	5	4.5	9	10.2	3	8.1	0	0.0	23	6.1	7-31	8.3
	ADJ.	6	4.8	5	4.5	12	10.2	6	8.0	0	0.0	29	6.4	38	8.5
7B	ORIG.	2	1.5	4	3.6	2	2.3	0	0.0	0	0.0	8	2.1		
	ADJ.	2	1.6	4	3.6	3	2.6	0	0.0	0	0.0	9	2.0		
8A	ORIG.	1	0.8	3	2.6	4	4.5	1	2.7	0	0.0	9	2.6	8-15	4.0
	ADJ.	1	0.8	3	2.6	5	4.3	2	2.7	0	0.0	11	2.4	19	43
8B	ORIG.	0	0.0	2	1.8	3	3.3	1	2.7	0	0.0	6	1.6		
	ADJ.	0	0.0	2	1.8	4	3.5	2	2.7	0	0.0	8	1.8		
9	ORIG.	5	3.8	0	0.0	0	0.0	0	0.0	1	25.0	6	1.6	9-6	1.6
	ADJ.	5	4.0	0	0.0	0	0.0	0	0.0	5	26.4	10	2.2	10	2.2
10	ORIG.	13	9.8	2	1.8	2	2.3	2	5.4	0	0.0	19	5.1	10-19	5.1
	ADJ.	12	9.6	2	1.8	3	2.6	4	5.3	0	0.0	21	5.7	21	4.7
11A	ORIG.	42	31.8	54	46.3	40	45.9	20	54.0	1	25.0	157	41.9	11-172	46.0
	ADJ.	41	32.8	54	46.3	51	44.0	41	54.6	5	26.4	192	42.3	211	47.0
11B	ORIG.	0	0.0	6	5.4	7	8.4	2	5.4	0	0.0	15	4.0		
	ADJ.	0	0.0	6	5.4	9	7.8	4	5.3	0	0.0	19	4.2		
12	ORIG.	6	4.6	5	4.5	7	8.4	6	16.3	0	0.0	24	6.4	12-24	6.4
	ADJ.	6	4.8	5	4.5	9	7.8	12	16.0	0	0.0	32	7.2	32	7.1
Y	ORIG.	2	1.5	1	0.9	2	2.3	0	0.0	2	50.0	7	2.0	Y-7	2.0
	ADJ.	2	1.6	1	0.9	3	2.6	0	0.0	9	47.2	15	3.4	15	3.3
TOTAL ORIG.		132	100.0	*114	*100.0	87	100.0	37	100.0	4	100.0	*374	100.0	*374	100.0
TOTAL ADJ.		125	100.0	*114	*100.0	116	100.0	75	100.0	19	100.0	*449	100.0	*449	100.0

CHART 1. Types and distribution of projectile points by Levels. Asterisk indicates total, includes erratic from Level II, No. 1–13850.

TYPES		LEVEL I		LEVEL II		LEVEL III		LEVEL IV		LEVEL V		TOTAL	
		NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
1A	ORIG.	9	37.5	9	37.5	5	20.8	1	4.2	0	0.0	24	100.0
	ADJ.	8	32.0	9	36.0	6	24.0	2	8.0	0	0.0	25	100.0
1B	ORIG.	9	90.0	0	0.0	0	0.0	1	10.0	0	0.0	10	100.0
	ADJ.	8	80.0	0	0.0	0	0.0	2	20.0	0	0.0	10	100.0
2A	ORIG.	11	64.7	4	23.5	2	11.8	0	0.0	0	0.0	17	100.0
	ADJ.	10	58.8	4	23.6	3	17.6	0	0.0	0	0.0	17	100.0
2B	ORIG.	8	61.5	5	38.5	0	0.0	0	0.0	0	0.0	13	100.0
	ADJ.	7	58.3	5	41.7	0	0.0	0	0.0	0	0.0	12	100.0
3	ORIG.	4	66.6	1	16.7	1	16.7	0	0.0	0	0.0	6	100.0
	ADJ.	4	66.6	1	16.7	1	16.7	0	0.0	0	0.0	6	100.0
4	ORIG.	3	100.0	0	0.0	0	0.0	0	0.0	0	0.0	3	100.0
	ADJ.	3	100.0	0	0.0	0	0.0	0	0.0	0	0.0	3	100.0
5	ORIG.	2	50.0	1	25.0	1	25.0	0	0.0	0	0.0	4	100.0
	ADJ.	2	50.0	1	25.0	1	25.0	0	0.0	0	0.0	4	100.0
6A	ORIG.	9	56.3	5	31.2	2	12.5	0	0.0	0	0.0	16	100.0
	ADJ.	8	42.1	5	26.3	6	31.6	0	0.0	0	0.0	19	100.0
6B	ORIG.	0	0.0	6	100.0	0	0.0	0	0.0	0	0.0	6	100.0
	ADJ.	0	0.0	6	100.0	0	0.0	0	0.0	0	0.0	6	100.0
7A	ORIG	6	26.1	5	21.7	9	39.1	3	13.1	0	0.0	23	100.0
	ADJ.	6	20.6	5	17.5	12	41.3	6	20.6	0	0.0	29	100.0
7B	ORIG	2	25.0	4	50.0	2	25.0	0	0.0	0	0.0	8	100.0
	ADJ	2	22.2	4	44.5	3	33.3	0	0.0	0	0.0	9	100.0
8A	ORIG.	1	11.1	3	33.3	4	44.5	1	11.1	0	0.0	9	100.0
	ADJ.	1	9.6	3	27.1	5	45.3	2	18.0	0	0.0	11	100.0
8B	ORIG.	0	0.0	2	33.3	3	50.0	1	16.7	0	0.0	6	100.0
	ADJ	0	0.0	2	25.0	4	50.0	2	25.0	0	0.0	8	100.0
9	ORIG.	5	83.3	0	0.0	0	0.0	0	0.0	1	16.7	6	100.0
	ADJ.	5	50.0	0	0.0	0	0.0	0	0.0	5	50.0	10	100.0
10	ORIG.	13	68.5	2	10.5	2	10.5	2	10.5	0	0.0	19	100.0
	ADJ.	12	57.2	2	9.5	3	14.3	4	19.0	0	0.0	21	100.0
11A	ORIG.	42	26.8	54	34.4	40	25.5	20	12.7	1	0.6	157	100.0
	ADJ.	41	21.3	54	28.2	51	26.6	41	21.3	5	2.6	192	100.0
11B	ORIG.	0	0.0	6	40.0	7	46.7	2	13.3	0	0.0	15	100.0
	ADJ.	0	0.0	6	31.6	9	47.3	4	21.1	0	0.0	19	100.0
12	ORIG.	6	25.0	5	20.8	7	29.2	6	25.0	0	0.0	24	100.0
	ADJ.	6	18.7	5	15.7	9	28.1	12	37.5	0	0.0	32	100.0
Y	ORIG.	2	28.6	1	14.2	2	28.6	0	0.0	2	28.6	7	100.0
	ADJ.	2	13.3	1	6.7	3	20.0	0	0.0	9	60.0	15	100.0
TOTAL ORIG.		132	35.2	114	30.4	87	23.3	37	9.8	4	1.1	374	100.0
TOTAL ADJ.		125	27.9	114	25.4	116	25.8	75	16.7	19	4.2	449	100.0

CHART 1 (*Continued*)
Number and percentage of each type by levels.

Early Horizon, it is probable that this point was made there where the workmanship was excellent in some of the Early points and generally of the later ones. In view of the major adaptation of the culture at the Kawumkan site to a non-hunting economy, we may have in this condition the explanation of the poor quality of the projectile points. Familiarity with the points from contemporary Great Basin sites impresses one immediately with the poor quality of the Kawumkan specimens. Sloppy workmanship on the points increases the difficulty of classification on the criterion of form, for it is difficult at times to determine what characteristics of the point are the result of intent and what of carelessness. Because of this condition there is plenty of ground for difference of opinion as to whether a point should be put in this or that category. However, on the major forms there is not much ground for difference of opinion.

DESCRIPTION OF TYPES

Types 1–5 are small both in length and breadth compared to the other specimens. To be sure, smallness and largeness are subjective criteria but an examination of the specimens will confirm what we mean.

Type 1A—Triangular, corner notched with straight-sided stem, straight across the base.

Type 1B—Like 1A except base of stem tends to be convex with sides of stem diverging toward base. We are not sure that this difference is significant for pattern or normal variation in workmanship.

Type 2A—Triangular, shouldered, straight-sided stem with straight base.

Type 2B—Like 2A except that base of stem tends to be convex with sides of stem diverging toward base. Same comments apply as made on Type 1.

Type 3—Approximates an isosceles triangle but the distance across the base is slightly less than the other sides. Base may be either straight or slightly concave.

Type 4—Small triangular, almost isosceles, side notched with concave base. This type generally found in the Great Basin at least from Developmental Pueblo on.

Type 5—Like Type 4 except this has a basal notch. Time and spatial distribution seems to be the same as for Type 4.

Type 6A—Corner notched, expanding stem with convex base.

Type 6B—Shouldered with contracting stem, sometimes coming to a point.

Type 7A—Side notched with portion in rear of notches slightly narrowed and with concave base.

Type 7B—Shouldered with convex base and slightly expanding stem.

Type 8A—Shouldered with expanding, bifurcated stem.

Type 8B—Side notched with lines of sides continuing in straight line to base which is concave.

Type 9—Shallow corner notched with expanding base.

Type 10—Triangular, slightly to markedly greater in width across base than along sides. Base straight. Could possibly be knives.

Type 11A—Generally long, narrow with a constricted stem forming a triangular termination or tang.

Type 11B—Like Type 11A but with a slight shoulder on one side. The type suggests the Sandia A type, but it must be recognized that we may have just sloppy workmanship again. On the other hand, there are several specimens which show this and the same characteristic occurred at Odell Lake on a very finely made point (Cressman, 1948). Compare figure 41-5 from Medicine Rock Cave.

Type 12—Edges near base converge increasingly and the base is straight across. Neither shouldered nor notched.

Type Y—Diamond-shaped in cross section with diagonal ripple flaking. Suggests the Eden Yuma type. One large knife or spear point, Level I, is put in this class though it is not the Eden Yuma type but definitely of the "generalized Yuma" variety with the shoulders and straight stem and diagonal flaking.

An erratic which does not fit closely any of these patterns was found in Level II and is illustrated in the lower right hand portion of figure 45-2. This specimen is badly abraded from having been washed along in the river gravels. Some occupant of the site during Level II time found it and carried it to the site. It was never reconditioned for use. It seems to have been shouldered with a slant toward the point instead of the usual straight edge of a shoulder. The stem is slightly constricted with a straight base.

VARIATION IN TYPES AND DISTRIBUTION

Chart 1 shows the distribution of all types within each level and indicates the variation of each type by levels. Figure 10 shows the comparisons graphically. The total number of identifiable points is 374 and the adjusted number is 449. Examination of the percentages of each type in the total adjusted column shows that the largest value is 47.0 per cent for Type 11. The order of preference for point types is as follows:

Order	Type	Per Cent
1	11	47.0
2	7	8.5
3	1	7.8
4	12	7.1
5	2	6.5
6	10	4.7
7	6	5.6
8	8	4.3
9	Y	3.3
10	9	2.2
11	3	1.4
12	5	0.9
13	4	0.7

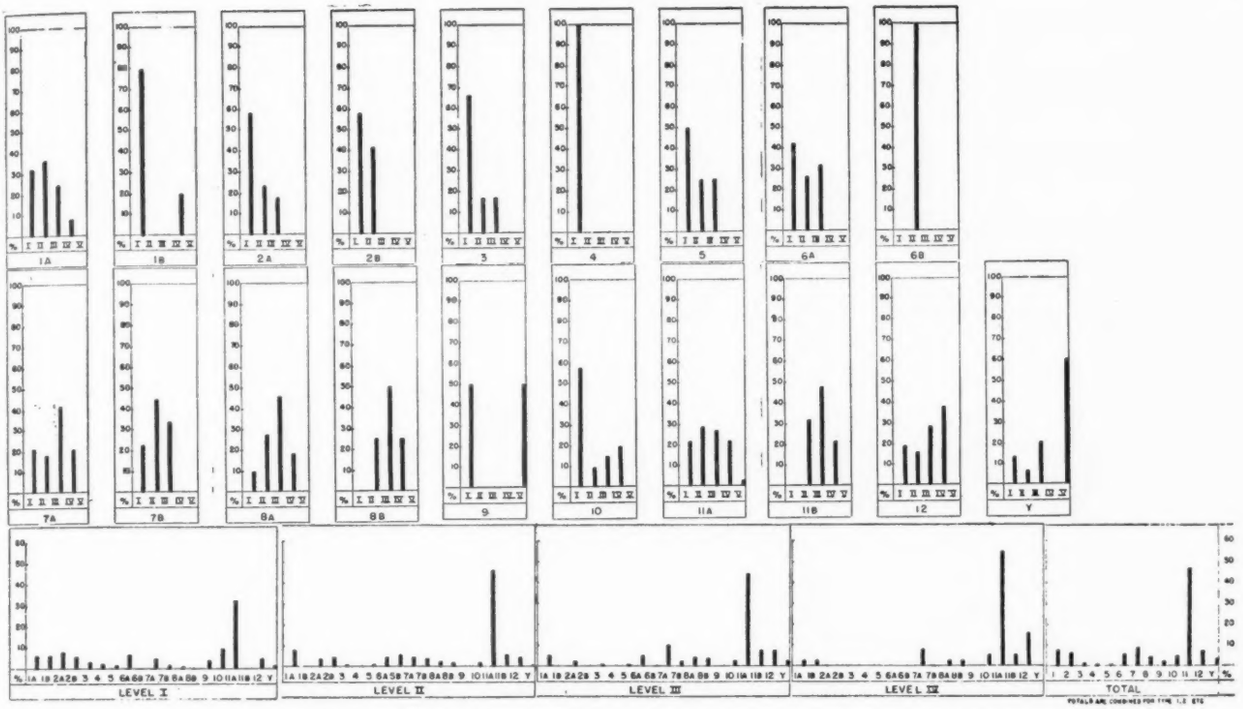


FIG. 10. Percentage distribution of projectile points by types and Levels by adjusted count.

The preceding tabulation for the total number of points without regard to level shows the total picture without regard to time. Therefore, to illustrate the type preference for levels, the first five in order of preference are indicated by levels.

Table 1 shows the great preference for Type 11 at all levels. Type 12 is second in Level IV, third in Level III, then drops out. Type 7 is third in Level IV, climbs to second in Level III, is third in Level II, and drops to fifth in Level I. Type 8 is fourth in Level IV, fourth in Level III, then drops out. Type 1 occurs as fifth in Level IV, tied with Type 8. Type 6 appears as fifth in Level III, climbs to second in Level II, then drops out although it has the same percentage in Level I as Type 7 and could have been used instead of 7. Type 2 appears first in this series in fourth place in Level II and climbs to second in Level I. Type I is fifth in Level IV, the same in Level II, and climbs to third in Level I. While Type 11 leads in preference at each level, there is a marked decline in Level I. Level IV has a very low number of small points, 4 "adjusted" of Types 1 and 2; there is an increase in Levels I and II at the expense of the larger points.

Types 7, 8, and to a lesser degree 6 and 9 are very characteristic of Great Basin points both in space and time. If we take table 1 and combine the Great Basin types in one group and the small ones in another, we get some interesting results when they are compared. Level IV shows a marked variance from the later pattern, with Types 7 and 8 making up 13.4 per cent of the series. In Level III, 6, 7, and 8 comprise 25.7 per cent and the square based Type 12 has dropped from 15 to 7.8 per cent. In Level II, 6 and 7 make up 18 per cent and 2 and 1 total 16 per cent. In Level I, Types 2 and 1 make up 26.4 per cent and 7 has dropped to 6.4 per cent while 10 appears with 9.6 per cent.

Types 7 and 8A, and to a lesser extent 6, 8B, and 9, have been shown to represent early established Great Basin types of points although 6 appears in the upper levels (Cressman, 1942: 81–82). These types persist in the caves in both large and small sizes. Types 1–5 are shown in the cave occupation to have been more closely associated with the bow and arrow than with the atlatl. Types 11, 12, and Y are sporadic in the Great Basin. If we combine the early established Great Basin types, 6–9, in one group and the small points,

TABLE 1

Order of Preference	Projectile Point Types Levels							
	IV		III		II		I	
	Type	Per Cent	Type	Per Cent	Type	Per Cent	Type	Per Cent
1	11	54.6	11	51.8	11	51.7	11	32.8
2	12	16.0	7	12.8	6	9.9	2	13.6
3	7	8.0	12	7.8	7	8.1	1	12.8
4	8	5.4	8	7.8	2	8.1	10	9.6
5	1	5.4	6	5.1	1	7.9	7	6.4

TABLE 2

Order of Preference	Projectile Point Types Levels							
	IV		III		II		I	
	Type	Per Cent	Type	Per Cent	Type	Per Cent	Type	Per Cent
1	11	56.3	11	51.8	11	51.7	S	33.6
2	12	15.0	GB	25.7	GB	22.6	11	32.8
3	GB	12.5	S	9.5	S	17.5	GB	17.6
4	S	5.0	12	7.8	12	4.5	12	4.8

GB—Great Basin; S—Small.

1–5, in another and on this basis list the order of preference as shown by the percentages of the four highest groups, we get some interesting results. They are shown in table 2 following.

In Level IV the Great Basin types are in third place and in Levels III and II they move into second place, but in Level I they have dropped to third. The small points occupy fourth place in Level IV, move up to third in Levels III and II, and take the lead in Level I. Type 11 holds a substantial first place until Level I when it is displaced by the small points. If we put Type 6 in with the small points (it occurs mostly in the upper levels of the caves and perhaps is mostly an arrow point), then there is no relative change in Levels IV and III, but in Level II the Great Basin types move to third place and the small into second, 12.7 and 27.7 per cent, respectively. In Level I the respective positions are unchanged but the difference in preferences are emphasized, for the small points then comprise 40.0 per cent of the total and the Great Basin only 11.2 per cent. The significance of these changes will be discussed shortly.

Chart 1 shows the incidence of each type by levels. The percentages are not statistically significant because the numbers are too small, except for Type 11. Some observations may be made using the numbers of points. Types I to V occur primarily from Level III on with the greatest number in Level I. One specimen of Type 1A and 1B occurs in Level IV and seem somewhat out of place. It is possible, but not too likely, that they could have been knocked out of the wall of the pit in which the excavation was being done, for the wall was high at this point. Type 6 first appears in Level III and continues throughout. Types 7 and 8 are found at all levels. One Type 9 is reported for Level V and then does not reappear until Level I. Type 10 is continuous but variable. Type 11A is continuous and varies little, but 11B which is found in Levels IV–II shows more than twice as many in Level III as in IV but two-thirds as many in II as III. Type 12 appears in all four levels. Y occurs in V, is lacking in IV, but occurs in the others. It is possible that the Type 9 specimen from Level V could have fallen unnoticed from a high level, but it is unlikely.

There may be some question about the classification of some of the few Y type specimens. Here we had small sections of the shaft and while the nature of the diagonal flaking was clear on some pieces, on others it was not as obvious and we may have had the section of a drill diamond-shaped in cross section. Every effort was made to avoid mistakes of this nature, but obviously they could happen even though I do not think they did.

SIGNIFICANCE OF THE CHANGES IN POINT TYPES

Throughout Levels IV, III, and II, Type 11 makes up slightly over half of all the points. The special preference for this point pattern is puzzling in view of its limited appearance elsewhere in the Great Basin. Even in Level I it is just below first place. The position of the different styles of points in table 2 shows that in Level IV the Great Basin type had not achieved any popularity. Then in the next two Levels its use had increased until it comprises one quarter of all points. In Level III the small points indicate a new development, either internal or as the result of diffusion of this pattern into the area. Since it has been shown from the cave materials that small points in general are correlated with the appearance of the bow and arrow, but not limited to it, we may have here the first signs of the appearance of this complex. These points are commonly the type associated in time with Pueblo development and the Paiute occupation of the Great Basin. Their increase in importance in Level II and their dominance in Level I reflect the formulation of the ethnographic horizon in the Great Basin and probably the movements of population which made up the later inhabitants of the area. If we use the percentages arrived at with Type 6 listed with the small points, then the change is more pronounced, for the small points then make up over 25 per cent of all and the Great Basin type drops to third place in Level II, and in Level I the small points comprise 40 per cent of all.

We may infer from this evidence, and it is corroborated by other data we shall present later, that during the period of Level II, and probably towards the end, rather marked changes occurred in the culture at this site and reflect changes that were taking place in the Great Basin and Southwest, the occupation of the area by the Shoshonean populations and the stabilization of their culture.

Of course, all these points as long as they are representative of any pattern for the Great Basin may be spoken of as Great Basin points. On the other hand, there is definite evidence of change in preference with the passage of time. It is possible that the types, such as 11 and 12, were introduced early with the non-barbed or shouldered patterns of the earliest hunters (Sellards, 1952; Cressman, 1947, 1948). Then at some place in

the Great Basin improved methods of hafting were developed which produced the barbed and shouldered point types. These were originally associated with the atlatl. With the introduction of the bow and arrow smaller points came into use, some types being introduced with that weapon while others were made on the same pattern as the atlatl point but reduced in size to serve more efficiently the lighter arrow. At the same time, there must have been bows of greater pull, for some of the larger points continue long after the atlatl is no longer in use. The new types of points then increased in number as the bow displaced the atlatl and the smaller points dominate the scene. While this is generally true and is borne out by the stratigraphic evidence from the caves and this site, it must be borne in mind that there must have been local or regional variations dependent on tastes and ecological adaptation, for it is obvious that concentration on a hunting economy based on large game would make different demands for weapons from one based on hunting small game, birds, and fishing.

Any effort to place our series in the Great Basin patterns must consider that Kawumkan Springs is on the northwestern periphery of the area, that it is a locality that must have been fairly well isolated from the major Great Basin movements from time to time and, therefore, influenced sporadically, and that its closest immediate connections would have been with the northeastern California area to the south in the Lower Klamath Lake region and the eastern slopes of the Cascade Range toward the north. This orientation may explain the localized preference for the Type 11 point, a point that must have been difficult to haft securely. The contact with the Great Basin would account for the introduction of the type of point in use there. The increase in popularity could be due to more contacts, a recognition of the greater facility this type of point had for hafting, or both. The dominance of the small points indicates that this area is eventually brought into the compass of the Great Basin culture although local characteristics are still maintained, and local variation is later enhanced.

Cressman (1947: pl. XVI, B) showed the variant point types found in the caves of the Northern Great Basin. Here are points that fall into our Types 11 and 12. At Odell Lake (Cressman, 1948: pl. VII, B) occurred Types 11A and 11B in the top 18 inches of the moraine immediately underlying the Mount Mazama pumice. Examination in the River Basin Survey Laboratory at the University of Oregon of the specimens from Benham Falls on the Deschutes River about fifteen miles south of the city of Bend showed Type 11 points. These points came from the surface of the Mount Mazama pumice and cannot be dated other than post eruption. Some of the points from Lower Klamath Lake from The Narrows and the Laird's Bay horizons should probably be classified as Type 11 although this is questionable. At any rate, we seem to have here at this site and stretching toward the north along the eastern slopes of the Cascade Range the area where the Type 11 was a preferred pattern and this preference continued throughout a long period of time. Certain other evidence may be offered that shows the contact with the Lower Klamath Lake area. First is the occurrence of the side-notched point, Type 7A. Cressman (1942: fig. 98, *a*, *d*) shows this type of point occurring frequently, especially in the Early Horizon. A particularly fine specimen of this type was found in the skull of one of the skeletons, No. 11–222, at Kawumkan Springs (fig. 57-6). The type of point appears in the four upper levels. Second, this same skeleton had a long bone projectile point in the lower left abdomen. This type of weapon is known in this area only from the Early Horizon at Lower Klamath Lake. Finally, a flesher of almost exactly the same kind as illustrated for Lower Klamath Lake (Cressman, 1942: fig. 97, *c*) comes from the bottom of Level III at Kawumkan Springs. The Lower Klamath Lake piece has kept the rounded part of the bone for a handle while the other specimen has been split down the center. However, the functional end is the same in each case. The ease of communication along the Klamath Lake system toward the south even at this time presages the association with the occupants of that region which later came to be indicated by the expression, Klamath-Modoc, to indicate the common traits shared in a distinctive pattern by the occupants of these two areas. To the north the slopes of the Cascades were easy of access and invited hunters.

Work on the Columbia River at Five-Mile Rapids (WS-4), since this chapter was written, east of The Dalles in 1954 showed a leaf-shaped type of point much like our 11A in exclusive use from the earliest occupation of the site for a very long time. The estimated time of initial occupation on the basis of geological evidence is at the end of the Pleistocene. This new evidence may have some bearing on the Type 11 point in Kawumkan Springs Midden. (Unpublished data.)

The evidence from the projectile points, then, shows a changing affiliation with the Great Basin but a strong regional color, and reflects the major cultural and population changes that characterized the Great Basin as a whole.

CUTTING TOOLS

Cutting tools are grouped in two categories: knives and scrapers. Knives consist of well-shaped bifaces either in the form of an elongated oval or leaf shape. Scrapers consist of all other specimens retouched for cutting.

KNIVES

Only six well-defined knives were found in the entire midden. They are illustrated in figure 47. One speci-

TABLE 3

SCRAPERS

Number and Percentage by Levels
Levels I–V

	I		II		III		IV		V		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
Original	709	34.0	571	27.4	558	26.8	230	11.0	16	0.0	2,084	100.0
Adjusted	695	27.5	571	22.7	715	28.2	477	18.6	78	3.0	2,536	100.0
Levels I–IV												
Original	709	34.6	571	27.9	558	26.3	230	11.2			2,058	100.0
Adjusted	695	28.3	571	23.3	715	29.2	477	19.2			2,458	100.0

men, probably the finest, No. 6, made from a gray chert was found in Level III. This is not quite symmetrical but has one edge somewhat less rounded than the other. The point end is very sharp while the other is more rounded and was probably the hafted portion. This conclusion is also indicated by the lack of the sharp serrations at the blunt end. The serrations are more pronounced on the straight edge, but on both they appear to have been broken off near the point, probably from use. Two long leaf-shaped blades come from Levels I and II, respectively, and each is damaged slightly at the haft end. The specimen from Level I was probably damaged by a digging tool. These three knives could have been used equally well for cutting or piercing as shown by their shape and cutting edges. The other three specimens from Levels II and I are the customary widely-used types found in many aboriginal sites.

The specimen illustrated as coming from Level IV does not come from the midden. It is an authentic piece which it was felt should be illustrated and this seemed to be the most convenient place. It was found during the digging of the garbage pit at a depth of five feet and some ten feet from the river bank at our camp a short distance up the Sprague River from the midden. No artifacts or evidence of occupation was found above the knife. There were small fragments of charcoal associated with it. The deposit was fine alluvium, mostly the fine volcanic dust carried in suspension by the river. The specimen certainly dates from no later than Level IV in the midden and perhaps earlier. It was made by percussion flaking and the material is black obsidian. There appears to be no evidence of pressure flaking or retouching.

The small number of knives from this midden is striking when one considers the usual large series to be found from Great Basin sites. The explanation is probably to be found in the food habits of the midden occupants. As will be shown later, there was very limited use of larger game animals for food. The main reliance was upon fish, birds, and probably small game such as rodents. Consequently, there was little use for larger tools which would be needed for butchering elk, deer, or like animals. The main need would have been for small, sharp-cutting instruments better adapted to the smaller animals.

SCRAPERS

To distinguish between scrapers and flakes we used the criterion of retouching. If the piece was retouched, it was called a scraper but if not, it was a flake. In some cases flakes of basalt with very sharp edges occurred, and if these showed any signs of shaping to an intentional form or edge modification these were also called scrapers. The number of specimens classified as scrapers is probably less than the number of pieces actually used by the occupants for cutting purposes.

From all levels a total of 2,084 scrapers was collected of which 2,058 came from the top four levels. The respective adjusted totals are 2,536 and 2,458. Table 3 shows the numbers and percentages by Levels and table 4 shows the deviation of each Level from the average per cent for all Levels. This table shows for the original numbers an increase by Levels from the earliest to the latest use of the site. The adjusted series, however, does not show this. If we take all five levels then Level V has the least, IV is next, and II

TABLE 4

DEVIATION FROM AVERAGE PERCENTAGE
Levels I–V

	I	II	III	IV	V
Original	+14.0	+7.4	+6.8	− 9.0	−19.2
Adjusted	+ 7.5	+2.7	+8.2	− 1.4	−17.0
Levels I–IV					
Original	+ 9.6	+2.9	+1.3	−13.8	
Adjusted	+ 3.3	−1.7	+4.2	− 5.8	

follows with Level III having the most. If we take the top four levels, the same general situation holds, but Level II is actually below the average percentage while III and I are above in that order.

What the significance of these slight variations in incidence is if anything except random variation it is impossible to say. Level II, as has been pointed out in the discussion of projectile points, was a period when new influences were making themselves felt, but I cannot find any convincing evidence that the variation in scraper incidence is any reflection of these changes, although it may be. Perhaps there is some inverse relation to the larger number of knives in Level II even though the sample is pitifully small. What is most convincing from the evidence is that these people used extremely crude instruments to do the work they needed to get done and that this could be accomplished by these small retouched flakes. It represents an adaptation of the tools to function with no consideration of anything except the effectiveness of the instrument. That the occupants of the midden could do expert flaking is clearly shown by the knives. The lack of careful work which could produce finely turned-out products appears also in the projectile points. Apparently these people were more interested in producing and using a tool that would do the job expected than they were in spending time and effort to make a fine product that would be no more effective than these simple, crude pieces.

DRILLS AND GRAVERS

Drills—Drill points or bits may be classified as follows:

Type 1—*Plain shaft.* This is a long, narrow implement with sides almost parallel.
Type 2—*Shaft is widened in the middle.*
Type 3—*Base widened.* The base expands and may be fairly round, triangular-shaped, or elongated. The base tends to be thin for hafting.
Type 4—*Double-purpose.* A combination of scraper and drill or gouge with a perforating point at one end or along the edge.
Type 5—*Notched base.* The base is notched laterally or diagonally like an arrow point for hafting. (Cressman, 1942: 85.)

A finger drill or gouge is one held between the thumb and finger and used directly by the hand. The point on this instrument may be curved or at least form an angle with the long axis of the instrument. This angle of the axis prevents this kind of tool from being hafted, for the angle of the axis of the perforating part would be at an angle to the axis of the drill and shaft. Kawumkan Springs furnished 14 drills. They are illustrated in figure 48. Their distribution is as follows: 7 from Level I, 4 from II, 3 from III, and none from Level IV. One finger drill or gouge comes from Level II (fig. 48-12). The distribution by levels follows:

TABLE 5

DRILLS

Type	Levels				
	I	II	III	IV	Total
1	3	1	1	0	5
2	0	0	0	0	0
3	2	3	2	0	7
4	0	0	0	0	0
5	2	0	0	0	2
Total	7	4	3	0	14

In Level I six are obsidian and one is white chert, No. 2; in Level II all are obsidian, and in Level III two are obsidian and one chalcedony, No. 14.

There is no substantial body of information for the area under consideration on the stratigraphic position of different drill types. Cressman (1942: 85–86) reports on 51 drills from the Northern Great Basin caves. This evidence indicates that Type 5 occurs late in the occupation of these caves. Types 1 and 3 are not differentiated by levels and occur throughout the cave occupation. This record is duplicated at Kawumkan where Type 5 occurs only in Level I, but the Types 1 and 3 are found throughout, except in Level IV.

Another point of some interest is the use of chert and chalcedony for drills, both here and in the caves, when they are scarcely ever used for projectile points. The reason probably is that these materials are harder than obsidian and make better bits.

GRAVERS

Only two gravers are recorded, one from Level II (fig. 48-13), and the other from Level IV. This accords with the lack of incising on artifacts from the midden.

GRINDING TOOLS

Under this heading are grouped mano-metates, mortar-pestles, and paint pallettes. The last group is included here because these items are essentially a part of the mano-metate complex although specialized in function. Spier (1930: 177) writes: "Both metates and mortars are used for grinding seeds, smashing roots, and similar operations. The metate or grinding slab is however the favored utensil." Essentially the same point is made by Barrett (1910: 252). Archaeological evidence from the historic sites tended to corroborate this preference for the mano-metate. The depth record at Kawumkan Springs Midden provided an excellent opportunity to examine the developmental history of these two complexes. Another feature of the historic Klamath-Modoc material culture was the unique two-horned mano for grinding *Wocas*. In addition, the immediate precontact village sites showed a variety of

forms of manos that were in all probability used in the preparation of the *Wocas* at different stages. Since the two-handled or horned mano is characteristic of the late Klamath, it was felt that the developmental history of the mano-metate complex would throw light on the dynamics of the culture of the area and consequently the materials have been examined in particular detail with this point in mind. In this section I shall at the end anticipate briefly the material from the house pit sites and then in a later section bring together all the mano-metate material as an illustration of the cultural dynamics of the area.

First, the evidence of priority for either complex will be discussed and then the records as showing or failing to indicate preference. Then the detailed characteristics of each will be discussed. Since so much of the material is broken, each fragment, when it could not be attached to another piece, is counted as one specimen. This probably weights the evidence in favor of the mortars and pestles since many fragments of mortars and pestles were found, but no whole mortars. Manos evidently did not fracture so easily as pestles and certainly metates seem to have been more durable than mortars. Some basin (circular) metates consisted of huge rocks that could be broken only with heavy tools (figs. 49, 58-1). We are obviously not dealing with whole units as would be desirable. However, we do not have whole units and have to follow some defensible method. Since the same method of using each fragment as a specimen for both complexes is used throughout, and with the possibility that easier fragmentation has perhaps weighted the evidence in favor of the mortar-pestle series, therefore the element of error should be constant and it seems reasonable to proceed by this method. At any rate, there is no other way.

The mano-metate complex in this area and for the Great Basin usually consists of a flat or slightly concave lower stone or slab, the metate, and a bilaterally flattened stone to hold in the hand as the moving stone, that is, the upper grinding stone or mano. The mano varies from round through oval to a rectangular form. There are variations on this depending on the care in manufacture, the length and the method of use. The grinding movement may be backward and forward, circular, or a combination of these. The method of movement of the mano will determine the shape of the used surface of the metate (Cressman, 1942: 89–90, fig. 49). I once found a thin slab metate in a desert camp-site that had been used on one side and then on the other until it became so thin that it had cracked through. The two pieces lay together as they had been abandoned. Certain areas show specialization in metates at a later date in the development, but the general type I have described may be considered the basic early type in the Great Basin area.

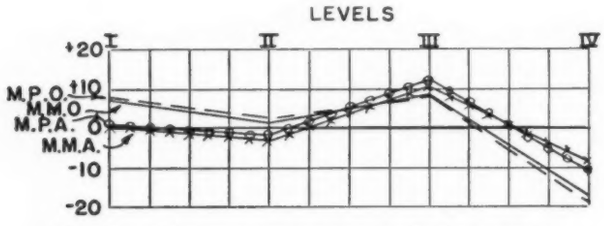


FIG. 11. Mano-metates, mortar-pestles by Levels, Kawumkan Springs Midden.

The mortar and pestle consists of a bowl-shaped utensil which has usually been prepared by smoothing on the outer surface and hollowing out by pecking and grinding on the inner. The inner or bowl-shaped part may approximate a true bowl or it may be roughly conical, as was the pattern in the Great Basin where this utensil occurred (Loud and Harrington, 1929; Spier, 1930: 176, fig. 11*c*). Obviously a conically-shaped bowl would require a different type of pestle, a pointed rather than a rounded end. In general, both types of mortars occur in the Klamath area with an emphasis on the conoid variety. In the Columbia River area to the north and west of the Cascade Range in the Willamette Valley, only the true bowl-shape type occurs.

PRIORITY OF MANO-METATE OR MORTAR-PESTLE

Table 6 shows the distribution of mano-metate and mortar-pestle by levels and as parts of a total "Grinding Complex." Both types of tools occur at all levels but there is a difference in the incidence. While there is no priority in the sense that one type occurs before the other, there is certainly evidence of change in preference or accent.

PREFERENCE IN USE OF MANO-METATE AND MORTAR-PESTLE

Table 6 shows that for both the original and the adjusted counts for the total series the preference for the

TABLE 6

DISTRIBUTION OF MANO-METATE, MORTAR-PESTLE COMPLEXES BY NUMBER AND PERCENTAGE, ORIGINAL AND ADJUSTED AS PERCENTAGE OF TOTAL

	Mano-Metate				Mortar-Pestle			
	Original		Adjusted		Original		Adjusted	
	No.	%	No.	%	No.	%	No.	%
I	90	19.1	88	15.4	62	13.1	58	10.1
II	74	15.6	74	12.9	53	11.3	53	9.3
III	95	20.1	123	21.7	64	13.6	85	14.9
IV	22	4.7	58	10.1	12	2.5	32	5.6
Total	281	59.5	343	60.1	191	40.5	228	39.9

Total of Mano-Metate and Mortar-Pestle Original = 472.
Total of Mano-Metate and Mortar-Pestle Adjusted = 571.

mano-metate is of the order of three to two. There is little variation between the original and adjusted series by levels but using the adjusted figures the following inferences are justified. In Level IV the preference of mano-metate is of the order of 2 : 1; in Level III it is 1.5 : 1; Level II, less than 1.4 : 1; in Level I it rises to just over 1.5 : 1. From this one may infer that the mano-metate pattern of grinding was more firmly established at an earlier date and that the mortar-pestle pattern reached its maximum popularity in Level II and then declined.

TABLE 6A

DEVIATIONS, IN MANO-METATE, MORTAR-PESTLE COMPLEX, FROM AVERAGE PERCENTAGE OF EACH TYPE BY LEVELS

	I	II	III	IV
Mano-Metate-Original	+4.1	+0.6	+5.1	−10.3
Mano-Metate-Adjusted	+0.4	−2.3	+6.7	− 4.9
Mortar-Pestle-Original	+3.1	+1.3	+3.6	+ 4.9
Mortar-Pestle-Adjusted	+0.1	−0.7	−7.5	− 4.4

TABLE 6B

DEVIATIONS IN MANO-METATE, MORTAR-PESTLE COMPLEX, OF EACH TYPE FROM AVERAGE PERCENTAGE OF THE TOTAL (BOTH TYPES) BY LEVELS

	I	II	III	IV
Mano-Metate-Original	+6.6	+3.1	+7.6	− 7.8
Mano-Metate-Adjusted	+2.9	+0.4	+9.2	− 2.4
Mortar-Pestle-Original	+0.6	−1.2	+1.5	−10.0
Mortar-Pestle-Adjusted	−2.4	−3.2	+2.4	− 6.9

The change in use of the two complexes is shown in tables 6A, 6B in a different manner, as a deviation

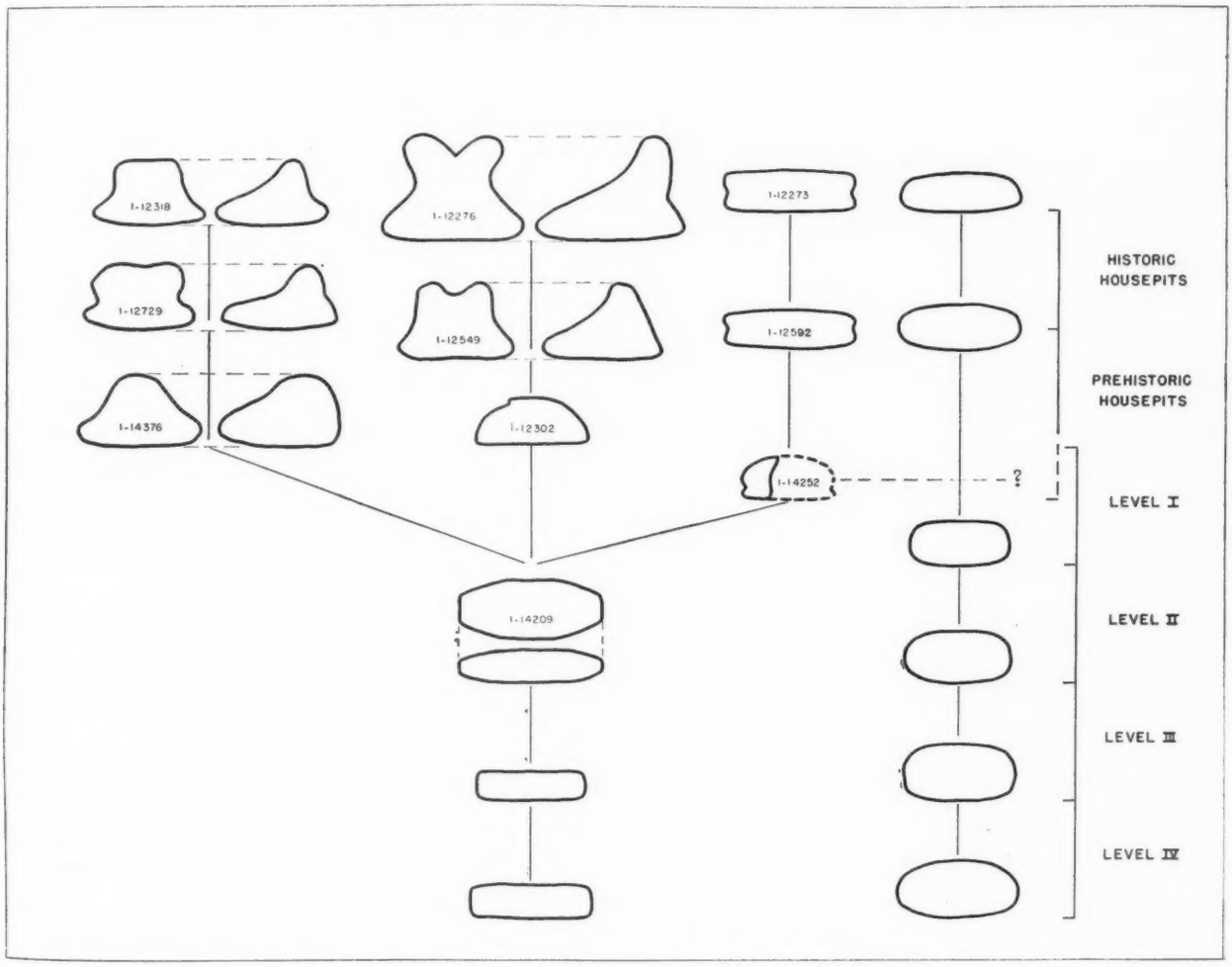


CHART 2. Inferred mano development in the Klamath Lake area.

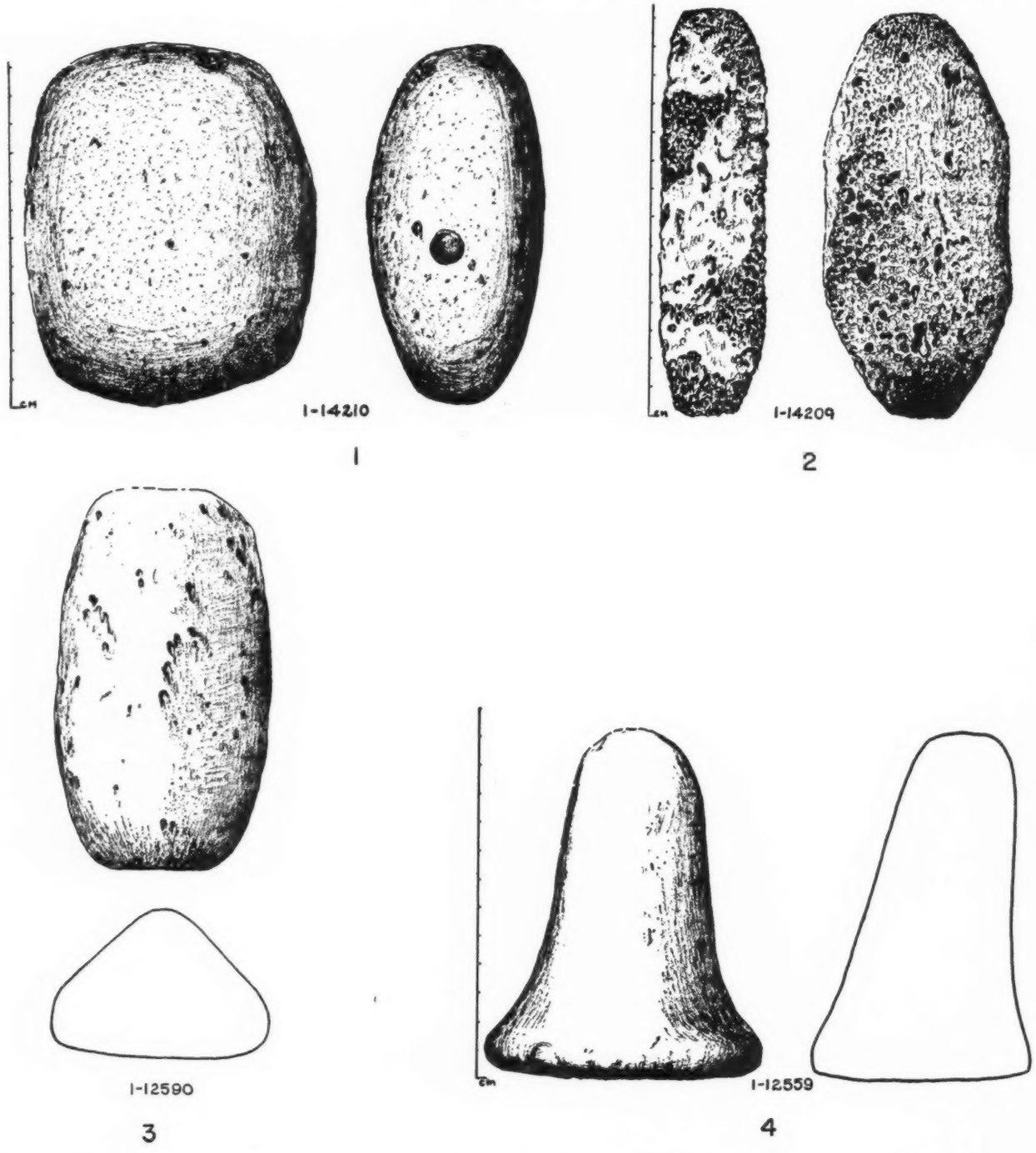


FIG. 12. Mano types, Kawumkan Springs Midden and house pits. (1) midden specimen; (2) shaped specimen from midden; (3) triangular piece, Long-IV; (4) handled or bell shaped specimen from Long-I.

from an average, showing an excess as a plus or a negative value to indicate below average use. It is of interest that Level III shows the greatest incidence of both types. Original figures for the mano-metate in Level I are 6.6 points above the average for all while the mortar-pestle value is 0.6. The adjusted figures are different but the relative difference is approximately the same. Figure 11 shows these differences.

MANO-METATE

Table 6 shows the number and percentage of specimens by levels. Two variants of the basic mano type occur, one the general Great Basin variety described above (fig. 12-1), and two, a variety very similar but more carefully shaped to a flat surface on each side and made from a light scoriaceous material (fig. 12-2). This latter type would appear to have been used for specialized purposes, such as grinding certain kinds of seeds or at certain stages in the grinding process when greater control of the mano was desired. The lighter weight of this type would make it an easier utensil to control. Varieties of manos from later periods are illustrated in figures 13 and chart 2. The relative significance of these two variants for the later variation of mano patterns will be discussed later. It is important to note here that no significant change in either type occurs until possibly Level I. On Chart 2 a girdled mano is indicated as either house pit or Level I. It was found in surface material and there is no doubt in my mind that it does not belong to Level I. The chart is a case of leaning over backward. Apparently the occupants of the midden found these two variants satisfactory for all their needs. Anticipating our later discussion, the questions may be raised here whether there was any change in the economy during the long period of the use of the midden, did the change in the mano type represent a technological change without economic stimulation, or does the change indicate diffusion from the outside? These questions will be discussed at a later point.

One of the striking characteristics of the metates is the use of really large rocks as a grinding base. Many fragments of the usual slab metate were found but no complete ones other than paint metates. However, a number of large specimens were found that were undamaged. Two of these are illustrated *in situ* in figure 58-1. A number of crude manos were found with these specimens. A surprising thing is that one had been turned upside down. Each had a rather elongated shallow depression that indicated both a rotary and a back and forth type of grinding. Toward the other end of this trench two other similar utensils were found but one was somewhat smaller than the other. It really required two men to lift each of these rocks. What could have been the reason for overturning one of these metate blocks? From the broken tools and utensils one gets the feeling of violence, whether it was internal or attacks from the outside is not known, but, as I shall point out later, the latter possibility has much in its favor.

The material from which the first type of mano was made is usually a fine-grained basalt. The source of the material is not in the immediate area but could be found in the river gravels at low water or at some of the exposures at various points in the general area. The second variant is usually made from a very light scoriaceous igneous rock or from very compact pumice. This material was ejected with a heavy content of gas. The immediate sources are not known to me but in view of the volcanic nature of the country it is likely that material of this sort could be easily found.

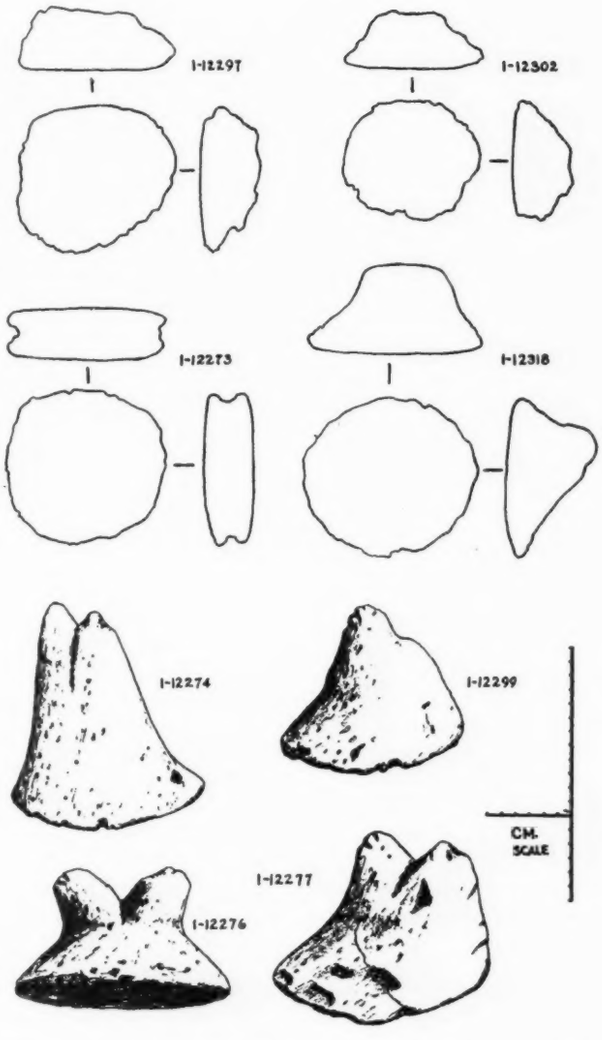


FIG. 13. Variant types of late manos including development of two-horned mano.

MORTAR-PESTLE

These utensils are usually made from a fine grained basalt. Further east in the old lake beds of the Great Basin one will frequently find scoriaceous basalt used. Figure 14 illustrates mortar and pestle specimens. No. 1-14346 illustrates the whole bowl by projection. One thing that is noticeable is the heavy wall which shows very clearly in No. 1-13882. It is difficult to understand how these mortars were broken unless it was the result of deliberate action. Figure 14-4, 5 illustrates

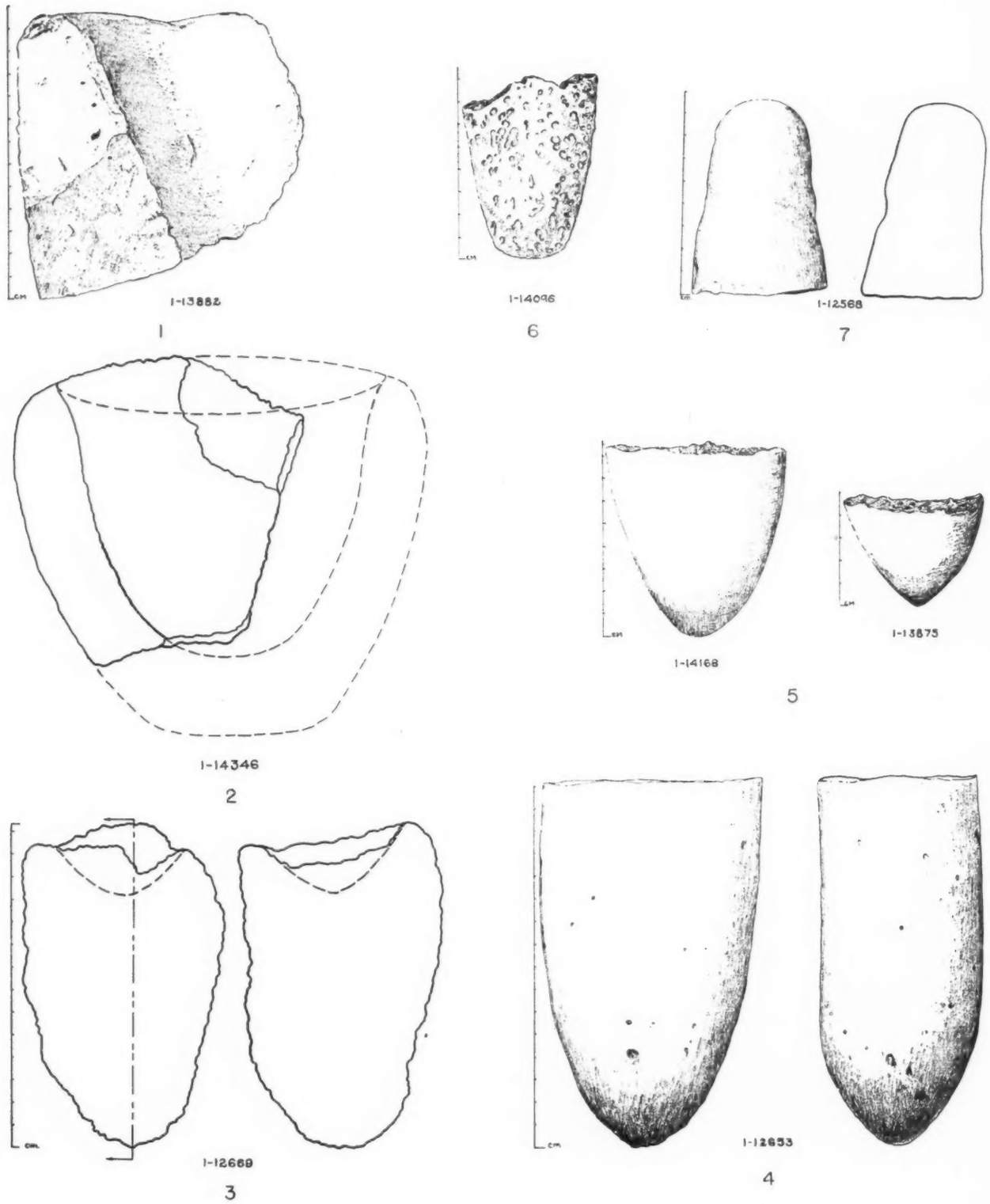


FIG. 14. Mortars and pestles from Kawumkan Springs Midden and house pits. (1) midden fragment; (2) reconstruction of midden fragment; (3) rudimentary midden specimen; (4, 5, 6) pestle fragments from midden; (7) pestle fragment, Long-I.

pestles that were used in conically-shaped bowl interiors. There is no evidence of change in type of either mortar or pestle throughout the use of the midden unless perhaps toward the end a smaller type of utensil came into use. The impressive fact about these utensils is their size and the expenditure of energy that must have been required to manipulate them.

COMBINATION GRINDING UTENSILS

A number of tools which could have been used as dual or multiple purpose grinding and crushing utensils were found at all levels. The usual combination of functions was grinding and battering, that is, a pestle at one end and a hammering stone at the other. Occasionally a specimen was found that could have been used as a pestle and again as a mano. There was the rounded end that was used in a mortar and a flattened side suggested that it was used for a backward and forward stroke on a flat metate.

The most striking combination tool from the entire series performed three functions: grinding both as a pestle and a mano, and hammering. It is illustrated in figure 50-10. It is a shaped piece of basalt just short of 58 cm. long. It weighs 9 kilos (20 lbs). The top surface is partially flattened, either intentionally or as the result of using it as an anvil. The ends have been rounded off, one as a pestle and the other for hammering, and the entire surface except the flattened top has been pecked and ground to the desired shape and smoothness. The bottom is slightly convex and this surface was used on the metate. Just inside the ends the under surface has been pecked out and smoothed down to provide finger grips when using the object as a mano. It was obviously a two-handed utensil and used in a forward and backward motion with a partial rolling motion. It was certainly too heavy to be used with only one hand. The end on the reader's left was used as a pestle while the opposite end was used as a hammerstone as shown by the fractures at that point. The specimen comes from the "kitchen" or occupation floor extending from 32X to between 34 and 35X (fig. 57-5). The elevation of the top center is 95.93 m., putting it in the bottom half of Level III.

PAINT PALLETTES

These utensils are simply metates used for the preparation of paint. The texture of the stone needed for this is thought to be finer than that used for grinding of foods. At any rate, these instruments are made from very fine grained basalt or slabs of sandstone. A number of complete specimens were found but for the most part we found only fragments. The piece illustrated in figure 49-4 had been used to grind red paint, hematite, and probably because of the calcium carbonate in the midden, there was a heavy deposit of the paint still adhering to it. The encrustation was so hard that a weak solution of hydrochloric acid was required to remove it. One specimen, made from sandstone, is a flattened oval in shape. There seems to have been no definite pattern as far as shape is concerned, but the requirements of the product did establish a pattern for a different kind of stone from the ordinary metate, a very fine grained basalt or sandstone. While both yellow and red pigments were prepared, the greater number of fragments of pallettes with a red stain show a much greater emphasis on the use of that color. Twenty-nine specimens are recorded with seven from Level I, six, eight, and eight respectively from the successive levels.

HOTROCKS

The stones are shaped to a clear-cut pattern. They usually are close to rectangular, generally about 10 cm. long, 6 to 7 cm. wide and usually less than 1.5 cm. thick. A piece of flow lava was taken and the stone shaped by percussion. Sometimes a satisfactory piece was found in the river gravels and used. Figure 44-2 shows a cache of seven of these stones, most of which are near the upper limits of size.

The name "hotrocks" was given this type of artifact by the students of the party for the following reason. Dr. Stern, who was engaged in ethnographic work on the Klamath Reservation while our project was underway, took several of these stones to some of his informants and asked to have them identified. There were two explanations, first, that they were used in cooking because they did not take up much room, and second, that they were heated and taken to bed to be used as we use a hot water bottle. The students decided that since both explanations might be true and that the function was to give off heat, therefore, we should call them "hotrocks." This seems to be as good a name as any other and since they are not described elsewhere in the literature, I have used this name.

Table 7 shows the distribution by levels and figure 15 illustrates the change in incidence through levels, as deviations from the average for four levels, table 7A. There were 111 in the original and 113 in the adjusted count. These artifacts, whatever their function, in-

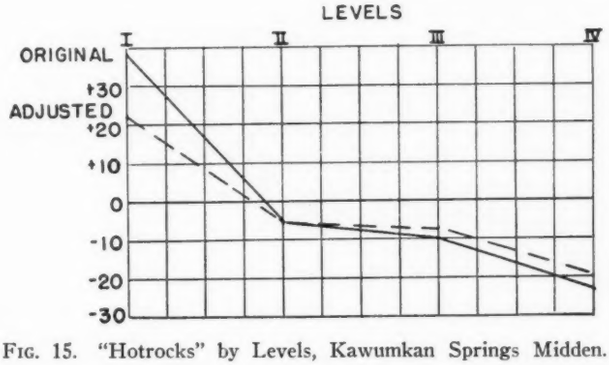


FIG. 15. "Hotrocks" by Levels, Kawumkan Springs Midden.

TABLE 7

SELECTED ARTIFACTS BY NUMBER, PERCENTAGE, ORIGINAL AND ADJUSTED BY LEVELS

Levels	Selected Artifacts															
	Mano-Metates		Mortar-Pestle		Mauls*		Hammer Stones		Arrow-Smoothers		Hotrocks		Drills		Choppers	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Level I—Original	90	32.0	62	32.5	1	33.3	9	14.7	1	100.0	70	63.1	2	25.0	44	22.3
Adjusted	88	25.7	58	25.4	0	0.0	5	6.5	0	—	65	57.5	2	16.7	42	18.5
Level II—Original	74	26.4	53	27.7	0	0.0	14	22.9	0	—	22	19.8	2	25.0	81	41.3
Adjusted	74	21.6	53	23.2	0	0.0	14	18.2	0	—	22	19.5	2	16.7	81	35.7
Level III—Original	95	33.8	64	33.5	1	33.3	32	52.5	0	—	17	15.3	2	25.0	65	33.0
Adjusted	123	35.8	85	37.3	0	0.0	39	50.7	0	—	20	17.7	3	25.0	85	37.4
Level IV—Original	22	7.8	12	6.3	1	33.3	6	9.9	0	—	2	1.8	2	25.0	6	3.4
Adjusted	58	16.9	32	14.1	0	0.0	19	24.6	0	—	6	5.3	5	41.6	19	8.4
Total—Original	281	100.00	191	100.0	3	100.0	61	100.0	1	100.0	111	100.0	8	100.0	196	100.0
Adjusted	343	100.0	228	100.0	—	—	77	100.0	0	—	113	100.0	12	100.0	227	100.0

* Not calculated because of small numbers and not included in totals.

creased in use throughout the history of the midden. There is very little difference between Levels III and II, but then there is a great increase in Level I. This progressive increase in popularity is in sharp contrast to the record of other types of artifacts, with their heavy accent in Level III or less frequently in II.

It is strange that none of these were found in any of the immediate precontact house pits we excavated. They were still used by the occupants of the Kawumkan Springs Midden houses (fig. 62). Here both round and rectangular specimens occur. This might mean that their use had been given up by the time represented by the villages. This theory raises the question of the reliability of the informants' statements given above. Since the different opinions were given by different informants, and each gave but one use for the article, I am inclined to think they were "giving us information" on the same basis that we arrived at it, by inference. My only knowledge of this kind of artifact, until our digging, was based on a number brought in to me from the Klamath Reservation by a former student who lived in Chiloquin and had made an extensive

TABLE 7A

DEVIATIONS FROM AVERAGE PERCENTAGE BY LEVELS FOR SELECTED ARTIFACTS, ORIGINAL AND ADJUSTED

	Mano-Metate	Mortar-Pestle	Mauls	Hammer Stones	Arrow Smoother	Hotrocks	Drills	Choppers
Level I—Original	+ 7.0	+ 7.5	—	−10.3	—	+38.1	—	− 2.7
Adjusted	+ 0.7	+ 0.4	—	−18.5	—	+22.5	—	− 6.5
Level II—Original	+ 1.4	+ 2.7	—	− 2.1	—	− 5.2	—	+16.3
Adjusted	− 3.4	− 1.8	—	− 6.8	—	− 5.5	—	+10.7
Level III—Original	+ 8.8	+ 8.5	—	+27.5	—	− 9.7	—	+ 8.0
Adjusted	+10.8	+12.3	—	+25.7	—	− 7.3	—	+12.4
Level IV—Original	−17.2	−18.7	—	−15.1	—	−23.2	—	−21.6
Adjusted	− 8.1	−10.9	—	− 0.4	—	−19.7	—	−16.6

collection from the area, both archaeological and ethnographic. His series he had dug up. During our 1951 excavation a collector visited our camp and had a number of these specimens which he had dug up in the Warner Valley to the east. He reported that they came only from the one site in which he had worked and he was otherwise unfamiliar with them. The Warner Valley location is in Paiute territory of the precontact times. Evidently we have here, as far as present knowledge goes, a tool or instrument that was localized in use and disappeared from the artifact assemblage before the development of later village life; at least for that period our evidence is negative. What the explanation of the occurrence of the objects in the Warner Valley may be, I do not know. Our cave excavations and surface surveys there never reported them. The cache of seven at Kawumkan would strongly argue against their casual nature as would the increase in numbers throughout the use of the midden.

CHOPPERS

Since any kind of a reasonably heavy, sharp-edged stone may be used as a chopper, one is faced with considerable difficulty in being sure that one is making an accurate classification of tools of this kind in an artifact assemblage where pattern or excellence of workmanship was not considered important. Our best example is shown in figure 46-1. This specimen, as are most, is made from basalt. A piece very much like this in shape and manufacture but made from obsidian was found in the house pit Long-1 (fig. 62-29). Some of the pieces classified as choppers could have been blanks from which flakes had been detached for use as scrapers, etc. A good-sized blank might still have been used as a chopper. There is no certain way of differentiating unless there is a clear-cut pattern for choppers and other tools.

We have 196 choppers by original and 227 by the adjusted count. Table 7 shows the numbers and percentages by levels. Level IV contains 8.4 per cent (adjusted) and 3.4 per cent (original). Level III jumps to 37.4 per cent (adjusted) and 33.0 per cent (original); Level II has 35.7 per cent (adjusted), a drop, and 41.3 (original), an increase; Level I shows 18.5 per cent (adjusted) and 22.3 per cent (original). Using the adjusted series it is clear that Level III has the heaviest concentration with slightly less in Level II, considerably less in Level I. Figure 16 shows the deviation of both the original and adjusted percentages in points from the average (table 7A).

In view of the absence of bones of large game animals in the midden, it is clear that these choppers must have had other uses than butchering tools. Figure 20 shows that the highest incidence of game animals was in Level IV and next in Level III, but in the latter it was very low indeed. These tools must have been used for cutting firewood, materials for houses or shelters, and similar purposes. There were two elk horn wedges in the midden, one each from Levels II and III, but none from the house pits. One was found in Medicine Rock Cave (fig. 41). The tool illustrated in figures 46-4 and 18-2 may have been a stone wedge used as a splitting device. Strong, Schenck, and Steward (1930, Pl. 21) illustrate what appear to be similar tools for The Dalles-Deschutes area on the Columbia River. Our specimen was found near the bottom of the midden during the season of 1948 when we were excavating the house pits on the surface. In an effort to locate the limits of the pit excavation I ran a trench out from the side to establish a profile. I found that artifact material was appearing outside of the pit and sank the trench to the bottom of the midden to test the fill. It was near the bottom of this trench or pit that the specimen was found. It would seem that the occupants of the midden used these choppers as hand axes and that they made very little use of the elk horn wedge.

Barrett (1910: 252) speaks of the elk horn wedges: "It [maul] was used in driving the elkhorn and mountain-mahogany wedges which were employed in splitting trees, particularly for canoe making, . . . Neither the wedge nor any other elkhorn implement is now to be found in this region."

Spier (1930: 171–172) speaks of "elkhorn picks" used for cutting and splitting trees but does not mention the wedge. He says, "Yew wedges are not known." Elkhorn wedges are plentiful in the Modoc area around Lower Klamath Lake. The few pieces of pointed antler tines we found are probably flakers, for they are too light to be used for picks as described by Spier. If elkhorn antlers had been used by the midden occupants as picks, in view of the preservation of antler and bone objects by the calcium carbonate in the deposit I am sure they would have been preserved.

The inference that must be drawn from this evidence is that the complex of elkhorn wedge and antler never appeared in strength in the artifact inventory in the Klamath area although at an early date it was known. If elkhorn picks were used they do not appear with other bone and antler artifacts in any of the sites excavated. The reliance of these people to work up logs into finished products must have been mainly upon fire and stone tools of a crude kind.

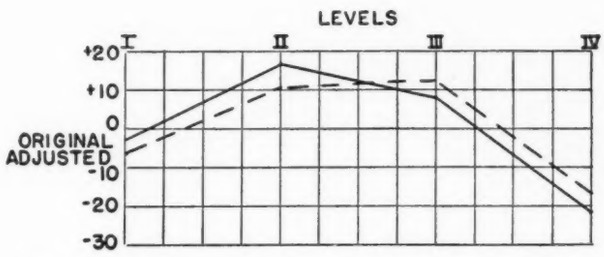


FIG. 16. Choppers by Levels, Kawumkan Springs Midden.

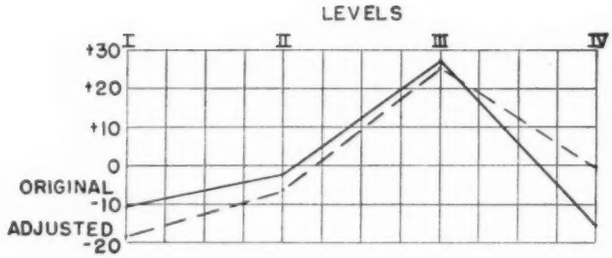


FIG. 17. Hammerstones by Levels, Kawumkan Springs Midden.

HAMMERSTONES

In a cultural inventory such as this, hammerstones are even more difficult to identify beyond question than choppers. Usually any stone which shows evidence of battering or spalling from striking another stone has to be put in this category (fig. 18-1). There are none of the well-shaped discoidals with center depressions for finger grips here. One end of a pestle sometimes shows evidence of having been used as a hammer. Mostly there is no pattern for the tool other than something that can be held easily in the hand, and the spalling.

Table 7 gives the numbers and percentages of hammerstones by levels. There were 61 (original) and 77 (adjusted). The adjusted percentages for the adjusted values are 24.6, 50.7, 18.2 and 6.5 from Level IV to I in that order. For the original the corresponding percentages are 9.9, 52.5, 22.9, and 14.7. It is clear that hammerstones are most numerous in Level III and drop to little importance in Level I. The deviation in points from the average percentage for both original and adjusted counts is shown in figure 17, table 7A.

MAULS

In the absence of wedges one would not expect to find their counterpart, mauls. This is essentially the case in the midden. We have listed three mauls but I am not sure that the identification is correct. Two specimens are shown in figure 46-3, 6. Specimen 2 in this plate is made from a finely rounded piece of pink and white quartzite. The centers of both surfaces show a slight flattening made by careful pecking as does the outer edge at the circumference. If this is a maul there are four and this piece comes from Level IV. Since it is quite different in shape, it has not been in-

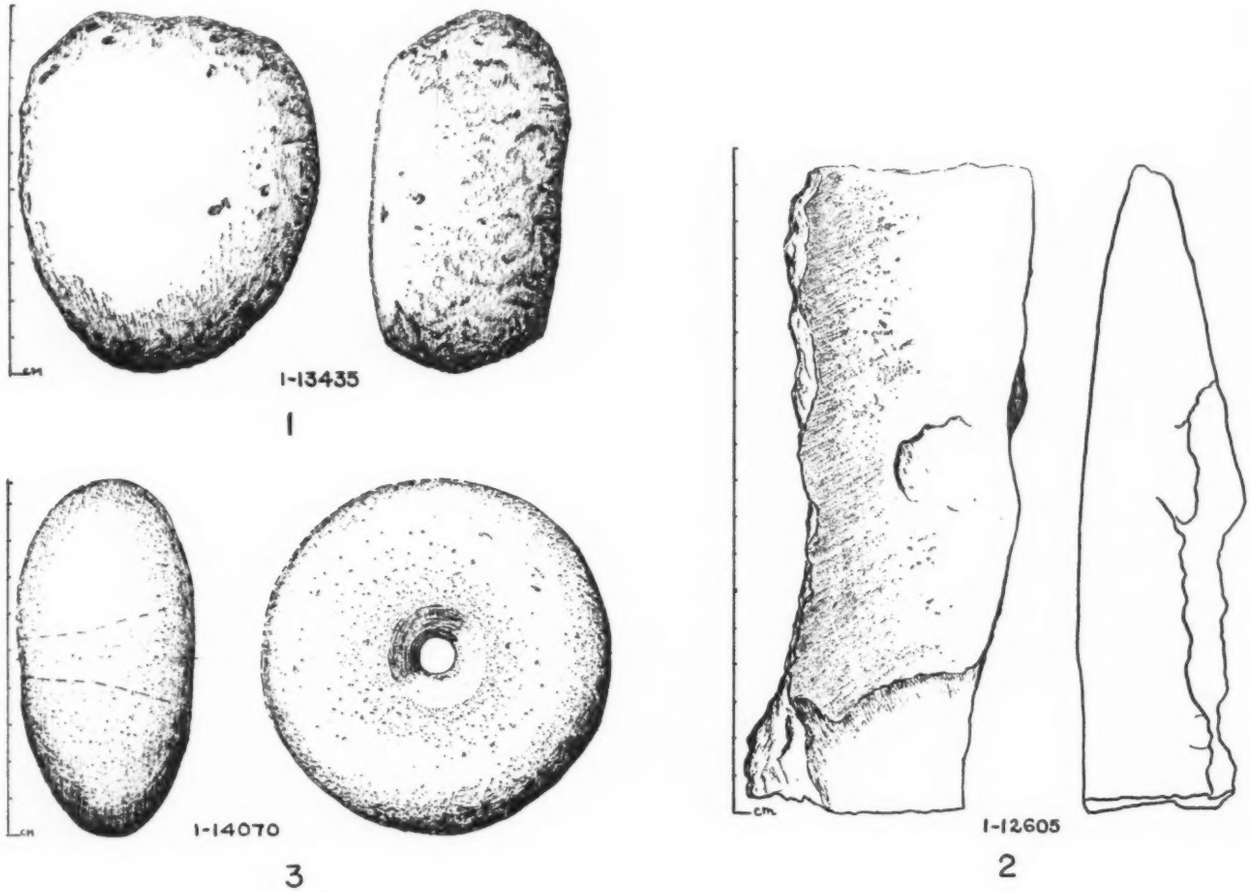


FIG. 18. Miscellaneous stone tools, Kawumkan Springs Midden. (1) hammerstone; (2) wedge ?; (3) arrow wrench ?.

cluded though it could very well be. Specimens 3 and 6 are shaped to a pattern, a flattened cylinder and one each comes from Level IV and III. A third specimen, not illustrated, was found the previous year in the house pit excavations in Level I in a trench cut outside the house lip. Specimens 2 and 3 were found together and were about 10 cm. below the bottom of the skull illustrated in figure 56-2. They do not seem to have been associated with the burial. A basalt flake-chopper lies between the two artifacts in the photograph. If the flattened cylindrical-shaped objects are mauls they must have been used to drive wooden wedges, for they do not show any sign of battering. They are not reported from any other sites. They bear no resemblance to any of the recognizable mauls from historic Klamath sites.

The measurements of 3 are: Length, 135 mm., width 130 mm., thickness, 96 mm.

PROBLEMATICAL OBJECTS

Nine of these objects were found, three in the fourth level, five in the third, and one in the second (fig. 51). Similar objects have not been found before in any of our excavations in the Northern Basin. Two of the specimens seem to be unfinished. One, No. 1-13358, varies in shape from the others but probably belongs to the same class of objects. This specimen is flat on one end and the diameter reduces gradually and evenly to the rounded other end. Possibly the specimen from Level II was intended to be the same shape when finished for it conforms to the same general outline.

The general shape of the specimens is spindle-like with the greatest diameter in the center; then the size is gradually and evenly reduced to each end. Three of these objects were found together near a burial (No. 11-222) (fig. 57-5), but they were some distance from the body and I do not think associated with it.

The descriptions and measurements of each specimen follow:

Level I—None

Level II—1

No. 1-14154—60 by 28 (max.) by 16 (at top) by 11 (at bottom) mm. Unfinished. Scoriaceous basalt. Bottom flat, top rounded.

Level III—5

No. 1-13924—Bottom portion of small pestle-like object; 27 by 24 mm. (at broken portion). Scoriaceous basalt. Probably a lengthwise groove on one surface which seems to have been slightly flattened.

No. 1-13016—77 by 29 mm. Unfinished, that is, only roughed out. Bottom intended to be flat and top rounded like No. 1-14154 from Level II.

No. 1-13509—3 specimens found close together. *Cf.* fig. 57-5.

a. 91 by 26 (at center), rounded off and reduced in size symmetrically to the ends which are roughly rounded. The piece is not quite rounded but one side is generally flattened while the other shows a convexity. The flattened side has a small lengthwise grove just over 1 mm. wide at the surface. The material is scoriaceous basalt.

b. 79 by 28 by 23 (the 5 mm. difference in diameters at the same point indicates bilateral flattening); the piece is bilaterally symmetrical. Material not identified.

c. 79 by 28 by 24, slightly flattened on one side with the opposite convex; one other surface is convex and the opposite flattened.

Level IV—3

No. 1-13358—75 by 27 (at large end) by 18 (at small end where rounding starts) mm. Circular groove 12 mm. from top end and another 9 mm. from the flattened bottom. Material not identified.

No. 1-13985—Small end or top of one like No. 1-13585; 36 by 21 by 19 mm. showing slight flattening. Circular groove 9 mm. from rounded end. Material not identified.

No. 1-14354—87 by 25 mm. (max. dia. at center). Symmetrically reduced in size to both ends which are rounded. What appears to be a slight flattening on one side (about 1 mm.) may be due to inequalities of grinding. Material not identified.

The material from which all of these are made is probably some variety of basalt. The rock is crystalline in the unidentified specimens.

The only thing in the literature remotely resembling these specimens is the wide category known as "Charm Stones" or "plummets" from central California. A careful comparison indicates that these are not like any of the widely variant forms illustrated for that region. I am uncertain whether the grooved pieces of our collection should be classed with the others. The grooving suggests suspension but since there is a groove at each end it suggests that they were fastened to some object by tying at each end. If so, they were hardly pendants.

There is no sign of paint on them as would have been the case if they had been used as paint-grinding pestles. In view of the tenacity with which paint adhered to the metates, one could rightly expect it here if these were paint pestles.

If they are utilitarian objects, I am inclined to suggest they were atlatl weights. They could have been fastened to the atlatl by sinew and pitch. They do not occur in any association which indicates their use. The three which were found together in Level III at the level of the burial were not associated with it in my opinion, for they were too far away from it. They are much more likely associated with the other materials from the stone platform or habitation level in which the grave had been dug. If this is the case, they could have been some kind of household articles or atlatl weights, for it would not be out of keeping to find the tools of both sexes who used the living space.

Since the above was written our excavations east of The Dalles at Five Mile Rapids has shown the use of bolas. The further suggestion is now offered that these objects might have been the same kind of weapon.

ARROW POLISHER OR SMOOTHER AND WRENCH

Only one arrow smoother or polisher was found in the midden, in Level I. It is made of a light igneous material which lacks the usual gas bubble pits. The specimen looks as though it has been broken along the bottom. It gives the impression that it was originally a mano which had broken and then been reshaped to be used as an arrow smoother. At one end it rises fairly straight to a height of 40 mm. and then curves slowly so that at the center the height is 43 mm., then curves down to produce a curved end with a height of 26 mm. The groove is 5 mm. deep and 12 wide at the top at the point of maximum height. The length is 76 mm. The groove is well polished from use.

Barrett (1910: pl. 21, 9) illustrates what appears to be the same type of tool. His photograph is taken from above. His specimen measures 9 cm. in length and ours 7.6, but as I said above, ours appears to have been broken. I have seen the same general pattern from the Great Basin in Oregon but the base is somewhat wider although the overall measurements in the other axes are about the same as these. The important point about these tools is the contrast they make with the long, narrow, flattened sandstone specimens with a full length center groove, sometimes on both of the wide surfaces, found west of the Cascades and other areas in the Northwest.

One arrow wrench (fig. 18-3), similar to a Klamath ethnographic specimen, was found in the area illustrated in figure 5.

BEADS AND PENDANTS

There were only ten recognizable items in this category (fig. 52). Glass, bone, shell, and stone were the materials used. The fragment of the circular bone bead, No. 1-13841, Level II, has in error been illustrated in figure 53-14, with the bone artifacts. This specimen is of particular interest because of the circle and dot incised decoration on it. This decorative style is distinctly northern and while it occurs occasionally along the Oregon Coast, it has not been reported hitherto for the Great Basin, to the best of my knowledge. The usual type of decoration on stone or bone in this area is the chevron design (fig. 69-1). Apart from this specimen there is no design element on any of these objects.

The glass bead from Level I (fig. 52-4) was undoubtedly lost on the surface by the Indians who used this site for fishing and other purposes in historic times. The mussel shell is that of the fresh-water mussel. In view of the large number of paint pallettes found, one is tempted to suggest that decoration was largely by painting the body. Detailed information on the specimens follows:

Level I—5

No. 1—Fragment of mussel shell pendant.

No. 2—Mussel shell pendant.

No. 3—Bone pendant, fragment, 24 by 6 (8) by 2 mm. Drilled through larger section for suspension.

No. 4—One dark blue glass trade bead, 12 mm. in diameter from hole to hole and 13 mm. in transverse diameter. Probably a bead which has worked into the upper part of Level I from historic occupation of the site.

No. 5—Fragment of circular bead, 14 mm. from end to end of fragment. Height of wall 8 mm.[1]

Level II—1

No. 1-13841—Piece of bird bone tubular bead with circle and dot decoration. *Cf.* p. 432 under bone artifacts for description and fig. 53–14.

Level III—3

No. 6—Stone bead, half only, 17 mm. maximum outside diameter, thickness of wall is 7 mm., diameter of hole is 6 mm.[1]

No. 7—Stone bead, approximately half, 17 mm. maximum diameter of outside, thickness of wall is 9 mm. and diameter of hole is 6 mm.[1]

No. 8—Stone pendant close to dog skeleton No. 20-18, but probably not associated with it. Length is 111 mm. Not quite rectangular since the maximum width near one end is 38 mm. and the other 27 mm. wide where the sides shift into ends. Top is oval and the bottom is slightly convex. Five mm. thick. Incisions notch both sides and bottom at about every 2.5 mm. Perforated at both ends with a larger hole at the bottom made by drilling 2 holes side by side and joining them. Steatite.

Level IV—1

No. 9—Stone pendant, 45 by 26 by 3 mm. Hole at one end. Hole is less than 1 mm. in diameter and is drilled from both sides. Probably a flat river pebble picked up and used for this purpose. Found at the very bottom of the excavation.

BONE AND ANTLER ARTIFACTS

Only 24 artifacts of bone and antler were found in a total series of well over 2,500 specimens. This could hardly be caused by the disintegration of pieces when specimens from all levels are preserved. Many of the pieces show considerable amount of mineralization, a condition which would have assisted in their preservation. The only justifiable inference is that bone and antler were very little used by the midden occupants. The antler pieces (3) are illustrated in figure 54-1, 2, 3. Two bone specimens, 4 and 5, are also illustrated in the same plate while the other bone pieces with one exception are shown in figure 53. The exception is a piece of bone pendant which is shown in figure 52-3.

ANTLER

Levels I and II produced one antler wedge each, the only specimens from the entire midden. Level III pro-

[1] These are casts of body whorls of gastropods. The incisions on the outer surface are worm borings. These were picked up and carried into the midden by some of the occupants and possibly used as beads. I am indebted to Dr. Ewart Baldwin of the Department of Geography and Geology of the University of Oregon for the identification of these specimens.

duced the large flesher (figs. 54-3, 19-1) made from a portion of an elk antler. Associated with this was the bone flesher, No. 5, in the "kitchen" assemblage between 32 and 34X and 2-4Y. Figure 4 shows the location of this "kitchen." It must have been used almost from the beginning of the mound. While the profile shows the bottom of the "kitchen" at the bottom of the excavation, it is not really at the bottom of occupation but we had reached the water table and discontinued work just below the bottom of the stones. Under the stones at the 32X end were two skeletons of adolescents, obviously placed there before the stone platform was built. Among the stones (fig. 57-1, 5) were fragments of manos and metates, the large two-handed combination tool, a portion (nuchal) of a human skull, the small pestle-like objects and a wolf mandible. These two fleshers are without doubt a part of the housekeeping paraphernalia.

BONE

The bone material (fig. 53) consists of fish gorges, possibly parts of fish harpoons, awls, flakers, a needle, a knife, ornaments, and a long bevelled end projectile point. Two fish gorges (fig. 53-2, 16) were found, one in Level I and the other in Level III. These were fastened to the line in the center and pulled through the water as a lure, perhaps sometimes having been thrust down the throat of a small fish. A tug on the line after the gorge had been swallowed pulled it crossways in the fish. One of these was found in Medicine Rock Cave above the pumice (fig. 41-4, no. 6). The three specimens we have listed as parts of harpoons may be either that or large gorges, or even parts of fishhooks. Barrett (1910: pl. 22) illustrates the various types of these instruments in use by the Klamath and Modoc Indians. It is obvious from the illustrations that no definite identification of our specimens can be made other than that they are fishing gear. It is important that in Level III fishing was well enough established to have developed the instruments that worked sufficiently well to last into contact times.

The flakers and awls are without distinguishing characteristics that set them off from the usual range of these implements. The bone bead with the circle-and-dot decoration and the fragment of bone pendant have been referred to on page 430. Details are given in the inventory following.

The knife fragment, 18, was probably more of a dagger than a knife. The point is extremely sharp but the edges are fairly dull.

The most important bone specimen is the long bone projectile point with the bevelled end for hafting to a shaft (figs. 54-4, 19-3). This was found in the lower left abdominal part of the skeleton, 11-222, buried in the "kitchen" described immediately above. This point is exactly like those described from the Early Horizon at Lower Klamath Lake (Cressman, 1942). I have re-

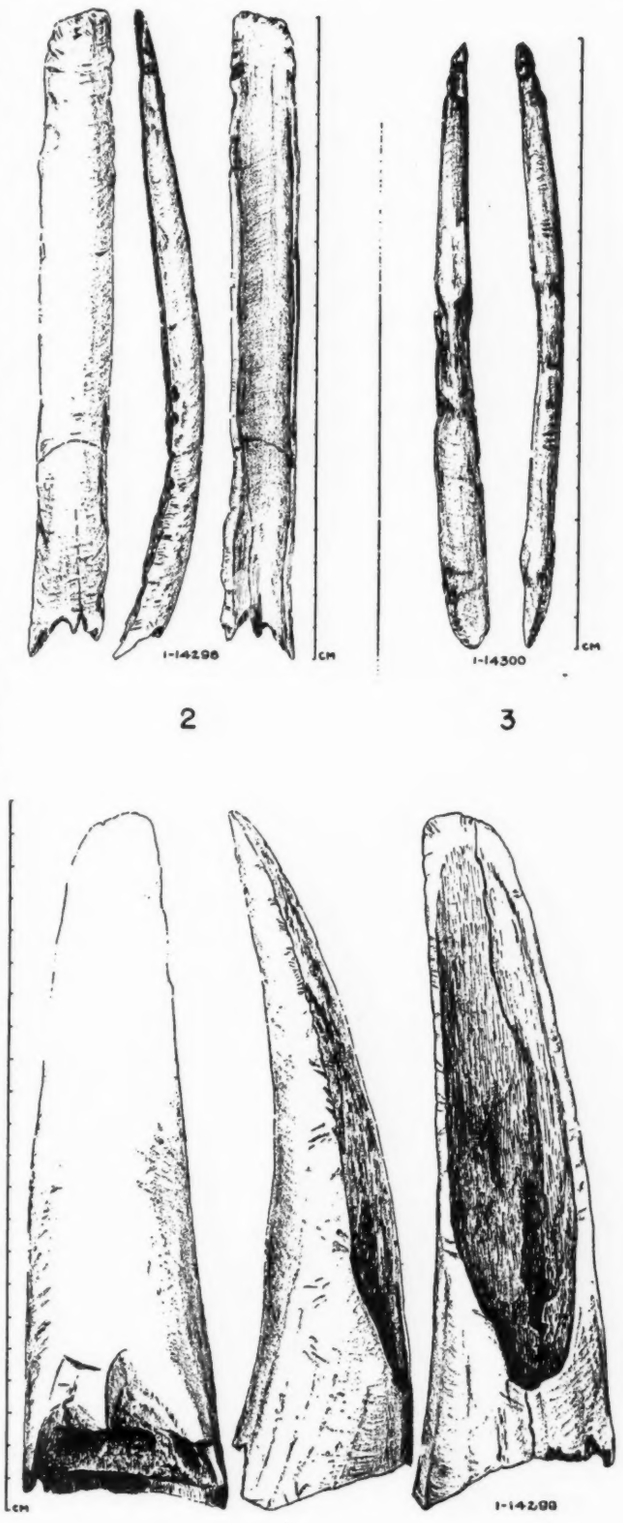


FIG. 19. Bone and antler artifacts, Kawumkan Springs Midden. (1) elk horn flesher; (2) rib flesher; (3) bevelled bone projectile point.

ferred on p. 411 to the side-notched projectile point in the skull of this skeleton. These bevelled bone points are known from the Clovis horizon where they occur with the Clovis fluted points (Sellard's Llano Culture) and from Florida where they are associated with a fossil fauna. In view of the Lower Klamath Lake area of use and the horizon represented there, it is clear that in the present state of our information this burial must be associated with that horizon. This association not only dates the specimen but the "kitchen" in which this victim of attack was buried.

The detailed inventory of the specimens follows:

Level I—8

No. 1-14571—Antler wedge, 87 by 32 mm. Fig. 54-1.

No. 1-14258—Fish gorge, 28 mm. long, 3 mm. thick and 5 mm. wide at center. Fig. 53-2.

No. 1-14142—Possibly a prong for a harpoon or of double pointed fishhook, 57 mm. long by 5 mm. maximum thickness at center. One end pointed, other bevelled. Fig. 53-1.

No. 1-14142 (a)—Possibly a side prong for a harpoon or of a double hook; if so, it goes with previous specimen. The base of this piece is roughened across the outer surface and covered by spots of some substance which may be pitch. The roughened surface is certainly to provide a base for the hafting; 44 by 5 by 2 mm. Fig. 53-4.

No. 1-13530—Three awls made from sections of rib bones. Pointed by a curving cut then the end is smoothed off to a point. Fig. 53-5, 6, 7.

No. 1-13793—Fragment of bone marked by 2 deep crosswise incisions and 6 short ones over the ridge. Use unknown. Fig. 53-3.

Level II-9

No. 1-14572—Tip of antler wedge, 33 mm. long and 20 mm. wide at top. Fig. 54-2.

No. 1-13040—Flaker, double ended with ends of different sizes for removing flakes of different coarseness; 119 by 7 (at center) mm. Fig. 53-8.

No. 1-14268—Flaker, fragment; oval in cross-section, flattened and wide bit; 35 by 9 by 6 mm. Fig. 53-9.

No. 1-13833—Flaker, fragment. Hollow on one side, otherwise like 1-14268; 40 by 9 by 4 mm. Fig. 53-10.

No. 1-13840—Awls, two points only. Fig. 53-11, 12.

No. 1-13832—Possibly a needle fragment made from bird bone or it may be a side prong for a 3-point fish harpoon as No. 1-14142 above. Fig. 53-13.

No. 1-13841—Fragment of bone bead, probably bird bone, bearing circle and dot-incised decoration; 8 by 8 by 1 mm. Fig. 53-14.

No. 1-13607—Awl from rib of large animal in same style as 1-13530 in Level I; 123 by 21 by 5 mm. Fig. 53-15.

Level III—5

No. 1-14300—Bone projectile point. *Cf.* fig. 19-3; 190 mm. long, 15 mm. wide at 45 mm. from base, 12 mm. in diameter at rounded portion where the sharpening begins at 64 mm. from point. The base is bevelled on one side for hafting for 70 mm. The part between 70 and 115 mm. from the base is badly chewed by rodents. The point is also chewed. Specimen is bent by earth pressure. This point was in the left abdominal region of burial No. 11-222. Fig. 54-3.

No. 1-14298—Flesher from long bone of some large animal made from slightly less than a half cross-section of the bone. *Cf.* fig. 19-2. Base is broken and that section is missing; bent by earth pressure; 210 mm. long by 22 across outer surface to outer surface and 11 mm. thick. Work end is smoothed down to a chisel shape. Fig. 54-5.

No. 1-14299—Elkhorn flesher. *Cf.* fig. 19-1. Length along concave surface is 210 mm., width at base is 60 mm. and thickness is 45 mm. Fig. 54-3.

No. 1-14158—Fish gorge. Same as 1-14258 from Level I; 16 by 4 by 4 mm., one point broken off. Fig. 53-16.

No. 1-14157—Possibly piece of harpoon prong, like 1-14142, Level I; 32 by 15 by 2 mm. Fig. 53-17.

Level IV—1

No. 1-13101—Bone knife or dagger (?) fragment. Length is 140 mm., maximum width is 19 and thickness is 4 mm. Base is missing; highly polished and a dark amber in color. Fig. 53-18.

SUMMARY

The Kawumkan artifact inventory consists almost entirely of stone materials. This is, of course, usual in an open site. However, in view of the preservation of unworked bone, probably from animals used as food, 5,219 specimens, one would have expected bone artifacts also to have been preserved if there. This is especially the case because of the amount of permineralization that took place from the calcium carbonate released into the deposit by the mussel shells discarded after the contents had been eaten. The only conclusion that can be drawn legitimately is that the bone artifacts had never been there. The greatest number of stone artifacts are the small spall scrapers, 2,084, with projectile points next, 374, then mano-metates 281, choppers, 196, mortar-pestles, 191, hotrocks, 11, hammerstones, 61, with a scattering of other artifacts in small numbers. The lack of a well-developed scraper and knife complex is probably to be correlated with the adjustment to a small animal food economy to be discussed later. The spall scrapers would be well adapted to this use. The graphs showing the incidence of various artifacts by levels indicate that Level II and Level III represent the highest periods. In some instances, the adjusted figures shift the incidence from Level II to III. The approximation of the two levels is close. Hammerstones are the most numerous in Level III and "hotrocks" alone increase sharply in numbers after Level II. Projectile point types begin to change in Level III and in Level II the incidence of the small types 1–5 increases and in Level I they predominate. Type 11 point is the preferred individual pattern at all levels but when compared with certain groupings based upon known temporal and spatial distributions in the Great Basin its leadership is displaced; in Level I the small (types 1–5) have come to dominate the series with Type 11 second, and the Great Basin types, which had been in second place in Levels III and II are now in third place. The type 11 point indicates a northwestern orientation

while the small points mark the entrance into the area of those types which came to be characteristic of the Great Basin in the post-atlatl period of development. (It is possible that the two small points reported for Level IV belong to a later level and got into the fill from that level by accident during the excavation.) There is a preference for the use of the mano-metate over the mortar and pestle as grinding tools, but both occur throughout the use of the site. The few bone artifacts are distributed throughout all levels. The most significant bone artifact is the large bevelled-end projectile point from Level III which points toward a Lower Klamath Lake Early Horizon relation. While elkhorn wedges were known, their use was limited (two specimens). There is an almost constant relation of the proportion of obsidian and basalt used as reflected in the flakes from the two materials, about 10 per cent of basalt to 87 or 88 per cent of obsidian. However, if Level V is included the heaviest use of basalt and the lowest of obsidian are found there, but in Level IV the ratio given above is established.

There is an internal consistency in the evidence of the artifacts. They show with but little variation, as has been pointed out, a consistent evidence of an acceleration in Levels III and II. This seems to mean that external influences were making themselves felt for the first time during Level III and then the process carried on with the gradual acculturation of the area. The most significant class of artifacts for this analysis is the projectile point. On the level of techniques the occupants showed no skill as artificers as compared with their contemporaries from the Great Basin to the east, but this was because they did not care; skill in execution of stone tools was not a prized value. The main stone work in grinding and chopping tools represents a series of remarkably roughly made and heavy tools, although to be sure there are exceptions. In general we have a picture of a culture adjusted to an ecological situation, satisfied and conservative, gradually being exposed to external influences which it accepted and took over to a limited degree. The extent of acculturation on the material culture level seems to have been limited to the influences represented by the bow and arrow complex, but this may have been associated with population movement rather than simple diffusion through intermediaries. The change of incidence of artifacts in Levels III and II would tend to support the population movement theory.

VI. KLAMATH HOUSE TYPES: THE ARCHAEOLOGICAL RECORD

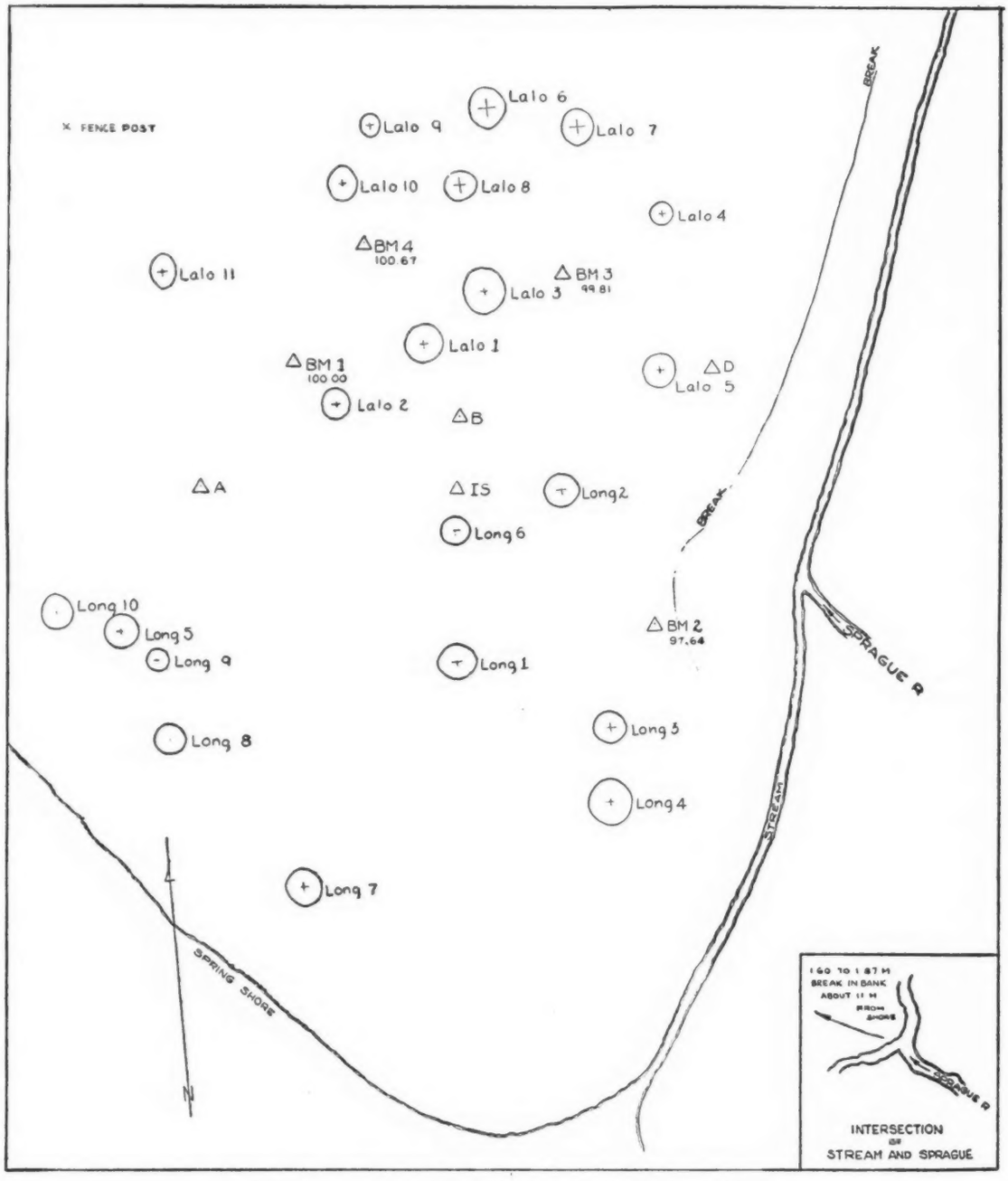
LOCATIONS

The house pit sites chosen for excavation were determined by a number of factors. First, we desired to start work on a village site that was occupied at the time of contact in order to work back progressively, if possible, toward the "unknown." Our first work was at a village on the south bank of the lower Williamson River (map 3). This area was about all that remained from the agricultural exploitation of the area. At one time the villages had been almost continuous, especially on the north bank of the river. After some excavations here we moved our operations to a village site, listed by Spier, on the east bank of the Sprague River east of Chiloquin. A final house pit was trenched at a site on the cliff south of the Sprague River just above the confluence with the Williamson. During the next season, 1948, we excavated in the village on the midden at Kawumkan Springs. During the season of 1951 we excavated the large house pit, KL-9, a smaller one, KL-10, and its midden, and a still smaller one at the site, KL-11, where our excavation was primarily directed to the midden. The house pits on the Williamson are designated by the name of the owner of the ranch on which they were located. Those on the Sprague River are listed as Sprague River-1, etc., while those on the Kawumkan Springs site are listed as Long-1, Lalo-1, etc., according to the property control of the section of the midden in which they were located. KL-9 to KL-11 sites are on the McCready Ranch and are a part of the complex of villages that existed close (within a mile or two) to the Kawumkan Springs. Figures 59–61 illustrate various house pits.

HOUSE DISTRIBUTION

The area along the Lower Williamson where we worked has been so modified by the economic development and use patterns that the distribution and numbers of the original houses are quite impossible to secure. In many cases the pits have been completely obliterated by clearing and leveling for farming or by logging operations. In the logged over area one often finds pits that certainly look like house pits but examination fails to produce any evidence of habitation. In the area around KL-9, on the McCready Ranch, there had been at one time numerous pits. The area had been lumbered over and then recently it had been worked over again by heavy equipment to remove stumps left by the earlier logging to secure material for the chemical industry. The obliteration of the pits had been general.

At Kawumkan Springs we had the least disturbed arrangement of pits. There did not appear to be any pattern of distribution other than a separation of five close to the spring on a level section (map 5). That location was not very satisfactory for houses, for in the late spring and early summer when the high water from the runoff of the snow water occurred, these houses were likely to be flooded. But Long-4 at this site, one of the largest and best constructed, was certainly flooded at times as shown by the character of the deposit and the closeness of the water table during the excavations. Large and small pits occur without any apparent pattern of relationship although in some instances there



LONG - LALO RANCH VILLAGE SITE

SCALE 2CM = 5M

○ - HOUSE PITS △ - DATUM AND △ POINTS

MAP 5. Long-Lalo Village site on Kawumkan Springs Midden.

appears to be a small one close to a large house. However, in the case of Long-3 and Long-4 efforts to determine whether connections existed between the houses failed to establish any.

Glenn Monteau, a part Indian who had married the granddaughter of Lalo who was the leader of the band at this locality at the time of the treaty, told us that his wife's grandmother had told him that the point of land on which the houses stood had originally extended into the meadow where the spring flowed into the Sprague

River. The spring cut through a portion of it and that part extending out into the meadow is now a series of islands. A house pit on at least one of the islands tends to corroborate the story. Roland Lalo, brother-in-law of Monteau, told us that his grandfather had told him that these pits had been lived in by people long before his (the grandfather's) time and that his people lived in a village back on the ridge running out toward the point. The character of the artifacts from these house pits strongly corroborates the elder Lalo's statement. Roland's grandmother had told him that when she was a small child they used to play in these pits and "found lots of things" in them and that they were deeper then than in her old age. The filling of these pits was probably not very rapid in view of the weed cover, but the later use of the area as a corral would certainly have speeded up the process. Table 8 shows the depth of fill in the Long-Lalo series to have been less than in the more recent. The remembrance above is probably the result of the trick so often played on our minds by the happiness of childhood.

The villages represented by the Gentry series of pits and the Sprague River-I–III were built on terraces or benches of the respective rivers. The Williamson River is deep with a quiet current at the point of our excavation after passing over a drop with marked riffles. The material into which the pits were dug here is a loamy, sandy soil with a considerable amount of pumice scattered through it. Under the floor of Gentry-1 in the packed sand, almost like a hardpan, were stones which were a part of the original terrace formation. McQuiston-1 was dug to the hardpan (I shall use this word here to indicate the very compact nature of the deposit even though it is perhaps not fully justified geologically). The Sprague River sites I–III were dug into a very soft surface deposit resting on a hardpan-like material. In the hardpan under Sprague River-1 were a considerable number of water-smoothed stones, remains of the old terraces.

On the F. F. McCready Ranch above the midden KL-11 there had been an extensive village on the terrace, but all signs of structures have been destroyed by agriculture. The site KL-10 and the houses obliterated by logging in the area, which included those in which Lalo's band lived at the time of the treaty, were on the old terrace north of Kawumkan Springs and west of the Sprague River where it makes the bend at the McCready Ranch. (See fig. 38-5, lower left.) Thus the evidence from these villages in which we excavated as well as those which have been destroyed indicates that sites chosen for villages were close to the river but sufficiently high above to be safe from floods, except for the possibilities mentioned at the Kawumkan Springs site. The huge house pit, KL-9, in contrast with the others, had been dug deep into very compact sand and gravel almost to the water table. The soft loamy soil into which most pits were dug provided good drainage and was easy to dig, a consideration of real importance when it is remembered that canoe paddles and digging sticks were the only tools for loosening the earth. At Kawumkan Springs the pits were dug into the earlier midden, the compactness of which varied from place to place depending upon the amount of moisture and the amount of lime leached out of the shells of the mussels which formed so much of the diet of the occupants.

STRUCTURAL FEATURES

SIZE AND SHAPE OF HOUSES

While the floor plan of the houses tends to be round, there is, of course, variation. The measurements in table 8 give the approximations for diameters, the depth of floor below the top of the rim, and the depth of the fill over the floor. The measurements of each house pit are shown in the drawings (figs. 20–34). The map of the pits on the Kawumkan Springs site shows their distribution, but the drawings for size are not to scale. Nineteen of these pits were measured and four excavated. Two were too indefinite in outline to justify measuring. When the surface of the ground, including the pits, has been eroded by natural forces and trampled over by cattle and sheep the original contours are bound to have been disturbed. Further, when the pits have been dug into a soft loamy soil or into a midden the exact outline is sometimes extremely difficult to establish and quite impossible to determine with certainty in other cases. The drawings give the best determinations possible. Where any doubt exists we used the ash lens near the center as the floor indicator and then tried to work out from this. I am sure that in all cases we have a very close approximation to the true floor even though there was no color differentiation in many cases. The ash lens was used as one indicator, debris as another, the compactness of the level as a third, and finally we cut a trench through the floor and extended it through the rim in those cases where we were in doubt to verify our judgment of the location and shape of the floor.

Certain inferences may be drawn from table 8. It is clear that the ideal pattern for a house pit was round but that it was seldom realized. In general the N-S is somewhat longer than the E-W axis. In a few cases in the Long-Lalo series the opposite was the case. The drawings of the floor plans show that a number of the contact period pits, the Williamson-Sprague River series, are slightly larger along a northwest-southeast axis but others do not follow this pattern. The lack of correspondence in the pattern would indicate that this variation is due to the particular conditions of the separate houses rather than to any relation to the orientation which would put the entrance toward the southeast.

There are two classes of houses by size, a large one with a diameter of between six and seven meters and a small one between three and four meters. These small houses may be ancillary to the large ones as cook houses,

shelters for slaves or dependents, etc. The lack of cooking facilities in them argues against their being cook houses. If we had more pits available along the Williamson River and more measurements along both sides of the Sprague where we excavated, we would doubtless have the two classes represented here. Our time was short when working on the Sprague and we had little time to measure the whole series of pits if we were to get any excavating done. Since excavating was the important objective we concentrated on that. However, personal observation of the pits in the area on both sides of the river shows many of both sizes.

The depth of the original excavated area measured from rim top to floor is greater in the Williamson-Sprague River pits than the Long-Lalo series by more than twice, as is the depth of the fill. Whether this represents a difference in pattern in depth or a function of the type of soil, it is impossible to say. The dirt of the midden in which the Long-Lalo pits were dug was just as soft as in the other area. The depth of KL-9 which was dug into compact sand and gravel suggests that the quality of the earth was not the deciding factor in the depth of the excavation. Nor can the depth be a function of the diameter as shown by the correspondence of these measurements for the two areas.

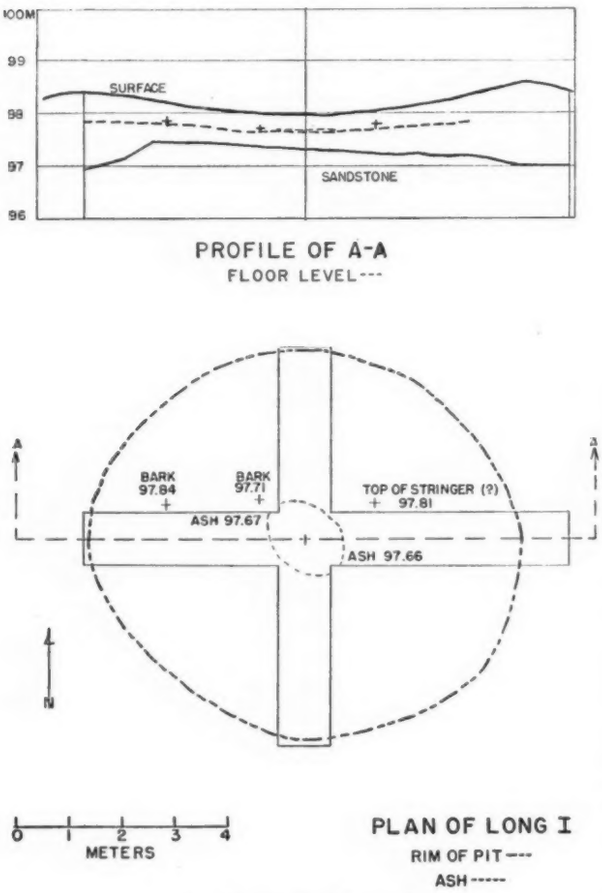


FIG. 20. Plan of Long-I.

TABLE 8

MEASUREMENTS OF HOUSE PITS (AVERAGES)

Williamson and Sprague River Pits *		
	N–S Axis	7.5 m.
	E–W Axis	7.5 m.
	Depth	1.5 m.
	Fill	0.7 m.
Long-Lalo (Kawumkan Springs) Nineteen Pits		
	N–S Axis	6.9 m.
	E–W Axis	6.8 m.
	N–S Axis	7.5 m.
	E–W Axis	6.5 m.
	N–S Axis	4.2 m.
	E–W Axis	3.0 m.
	N–S Axis	9.6 m.
	E–W Axis	9.0 m.
	N–S Axis	2.4 m.
	E–W Axis	2.6 m.
	Depth	0.6 m. (4 pits)
	Fill	0.3 m. (4 pits)
McCready Ranch		
KL-9	N–S Axis	18.0 m.
	E–W Axis	16.0 m.
	Depth	2.0 m.
	Fill	0.2 m.
KL-10	N–S Axis	6.0 m.
	E–W Axis	6.0 m.
	Depth	0.4 m.
	Fill	Uncertain
KL-11	N–S Axis	2.5 m.
	E–W Axis	2.5 m.
	Depth	0.4 m.
	Fill	0.05 m.
KL-12	N–S Axis	19.0 m.
	E–W Axis	17.0 m.
	Depth	2.6 m.
	Fill	0.5 m.

* Pit, Gentry-II, which was a sweat house, shallow, and about three by three meters not included in these averages.

Horizontal measurements from rim center to rim center were made by means of a steel tape along the axes determined by a Brunton compass. All vertical measurements were made by either a transit or an alidade from an arbitrary bench mark for the site. Depth is the distance the bottom of the unexcavated pit is below the height at the center of the rim. Fill means the depth of debris accumulated on the floor before excavation.

In the discussion of size, attention should be called to two pits, KL-9 and KL-12, because of their unusual size and depth. KL-9 was excavated completely in 1951 and KL-12 was measured and tested to verify that it was a pit and to determine the depth of the fill. KL-9 had a N-S diameter of 18 m. and was 16 m. wide in the opposite direction. From the top of the rim to the top of the fill was 2 m. while the depth of the fill was only 0.2 m. When Mr. McCready bought his ranch, on which this pit is located, more than forty years ago there was a fallen ponderosa snag which had originally

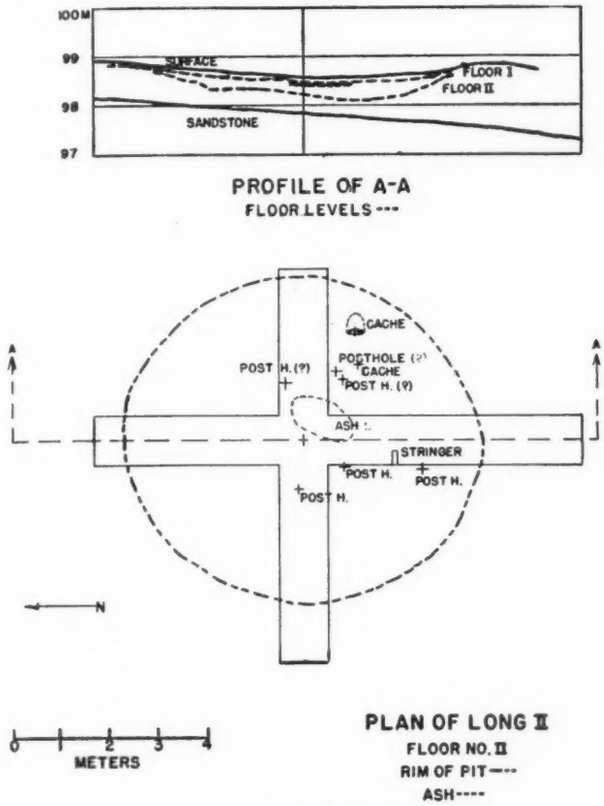


FIG. 21. Plan of Long-II.

grown from the abandoned pit. This tree in 1949 was approximately 25 inches in diameter at a point about 25 feet up the trunk from the base. Under ordinary circumstances a tree of this size and kind would be about three hundred years old. Mr. McCready said that the tree had been there when he bought the ranch in 1914 and appeared to be in about the same condition of rottenness then as in 1949. In 1950 we were able to break the snag up with a mattock and clear it from the pit.

This pit had been dug into a gravelly deposit, probably an old terrace built up by an ancient meander of the river. The material consisted of sand and gravel about the size of peas. The round symmetry of the house was broken on the northeast portion by a shoulder of cemented gravel through which the builders could not dig with their primitive instruments. The rim on this house was very low, probably as a result of weathering and cattle running over it.

KL-12 is even larger than KL-9, a meter more in each direction. The total depth of the original excavation here was three meters. This pit seems to stand alone and is difficult to explain, but there is no doubt that it is a house pit as shown by the floor and fire pit on it. No other house pits have been found in the vicinity and this one is located near Long Prairie which was noted as a dangerous place because of the grizzly bears to be found there.

POSTHOLES

According to the ethnographic evidence, there should have been a pattern of four postholes arranged in a rectangle with the long axis in a northwest-southeast direction with four rafters, one extending from each of the posts to the top of the original earth outside the limit of the excavation.

The archaeological evidence did not support the ethnographic claims. As a matter of fact, evidence of postholes is more marked by its absence than its presence. Postholes were found in the following house pits: Sprague River-II and IV. Lalo-II, Long-II (early floor), Long-IV, and KL-9. Sprague River-II (fig. 25), which was an oval-shaped house with a ground level entrance, had one posthole in the center, evidently a single roof support. Sprague River-III had two probable postholes for roof supports (fig. 25). Sprague River-IV (fig. 26) had two postholes approximately 1.7 m. apart. The distance between these holes makes it seem unlikely that there were ladder poles, but they could have been. There were no other signs of posts. Long-IV (fig. 22) had seven postholes. It is possible that we have here basically a rectangular pattern ori-

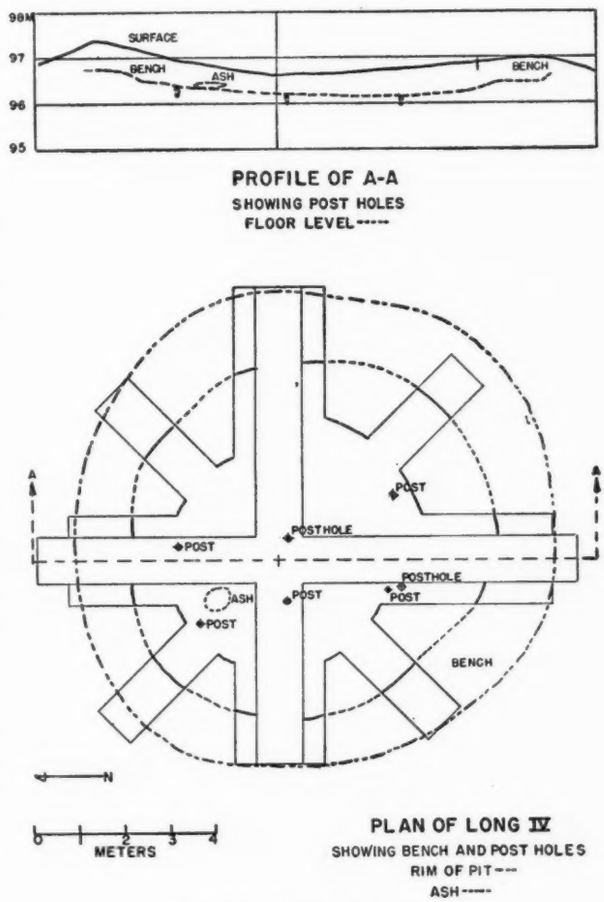
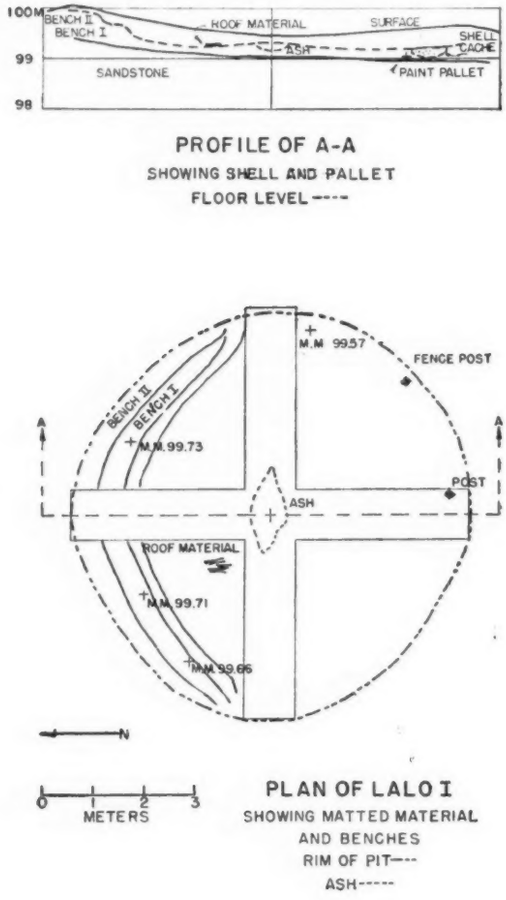


FIG. 22. Plan of Long-IV.

ented northwest-southeast. If that is the case, then the two centrally located posts would have been those of the ladder. The field evidence did not indicate the expected slant to these as should have been the case if the top of the ladder leaned against either end of the hatchway. The only explanation for the smaller post close to the main one at the southwest corner is that it was an auxiliary one for strengthening the main support. Lalo-II (fig. 23), which had been made over into what we assumed to be a storage house because of the bark covered floor, had in the original structure a pattern of six posts. Apparently here there was a rectangular pattern with a supporting post slanting in from each side. There was no evidence of any ladder nor was there any discoverable evidence of a side entrance. KL-9 (fig. 31) had the remains of a post at what would have been the northeast corner of the rectangle and what seemed to be a posthole at the appropriate position for the other post of the pair at the end of the hatchway. The position of a heavy tie beam on the floor with one end at the post and the other at the point where a supporting post would have been, if a rectangular pattern oriented northwest-southeast had been used, strongly indicates that this pattern was followed in this large structure. The water table came to the house floor so that the ground was extremely wet and it was difficult to determine with accuracy the details of postholes. My opinion, based on the observation of the position of the timbers and the floor condition, is that there was a rectangular pattern of house posts, but how many there were or whether there was a ladder with the posts set into the floor, I cannot tell.

The evidence indicates a lack of any well-developed pattern of roof supports, unless it is to be sought in



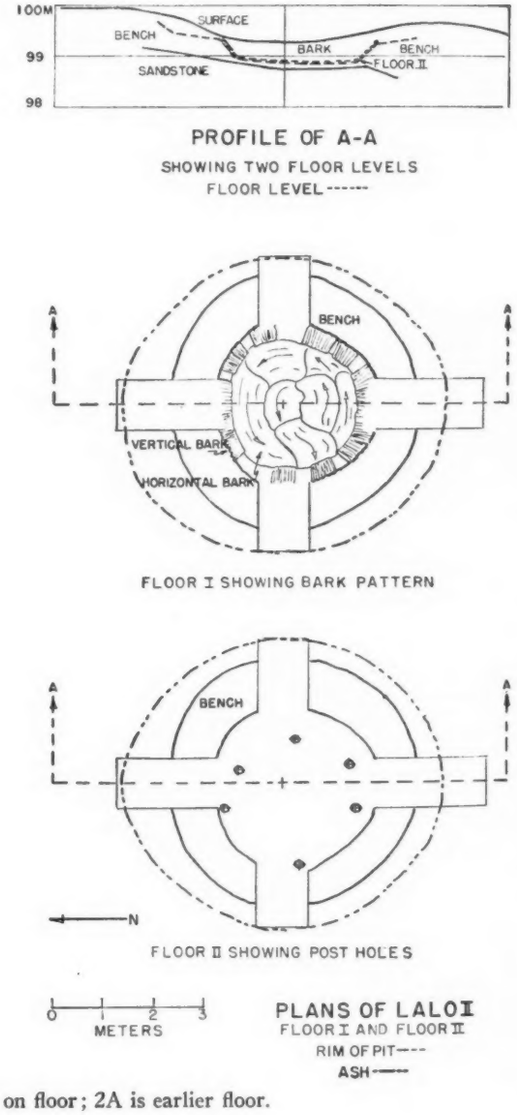


FIG. 23. Plans of Lalo-I, II; 2 shows bark paving on floor; 2A is earlier floor.

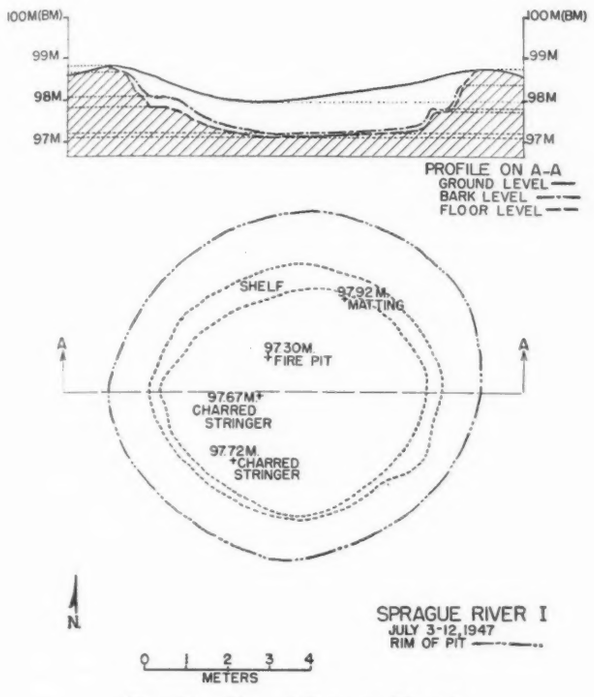


FIG. 24. Plan of Sprague River-I.

some other device than posts set into the floor in a rectangular pattern to outline and support a hatchway. There is a number of factors which confuse the problem including the Klamath practice of using a house pit over and over again after cleaning it out annually. We do not know whether this practice involved removing the posts as well as the debris. Even if it did, it is difficult to see why the last occupation of the house would not have left its marks. While it is difficult to pick up the casts or moulds of posts in this kind of earth, none the less it was possible in the cases mentioned. The only conclusion to be drawn is that there had not been posts set in the floor to start with. A second factor was the practice of burning the house after anyone died in it. This would account for the evidence of burning, but posts which burned down into the posthole would show the remains of ash or charcoal and could be observed. The practice of using side entrances and simple supports resting on the ground in use in the smaller and summer houses may have been used by the majority of people. Yet it is puzzling that there was not more in the way of timbers to be found. It is this last factor, the lack of roof timbers to any expectable extent, that makes it impossible to offer any convincing evidence of any well established pattern.

Roland Lalo and Leonard Long both reported that they had been informed by old people, his grandmother in Lalo's case, that the supports had been set on the ground. This was not the case in those pits for which we have described the posthole locations. On the other hand, probably both these men were right for the smaller houses. It is difficult to see how a large structure like KL-9 would stand without substantial supports. Long-II and IV, which are just over seven and nine meters respectively in diameter, show patterns approximating a rectangle as does KL-9. Merritt is 12 m. in diameter and Sprague River-I is 9 m., yet neither had the least sign of any supporting posts.

The possibility exists that a more or less dome-shaped house was constructed in some cases using heavy willows. These, if bound together, would give a remarkably strong base on which to place the outer covering and would in all likelihood readily support the weight of a person entering through a hatchway. However, there is the lack of evidences of ladders. Side entrances might have been used without cutting down the level of the edge of the pit. The presence of a bench in each house, which will be discussed shortly, would provide a step for this kind of entrance. However, we are still faced with the lack of roof rubbish in the pits. This might be explainable if the wood had been taken for fuel by others after a house was abandoned and collapsed. In a timbered country it would seem simpler to pick up bark and fragments which lay all around rather than clean out a pit to get the debris from it. Perhaps the problem was seen in a different light by the people who used these houses.

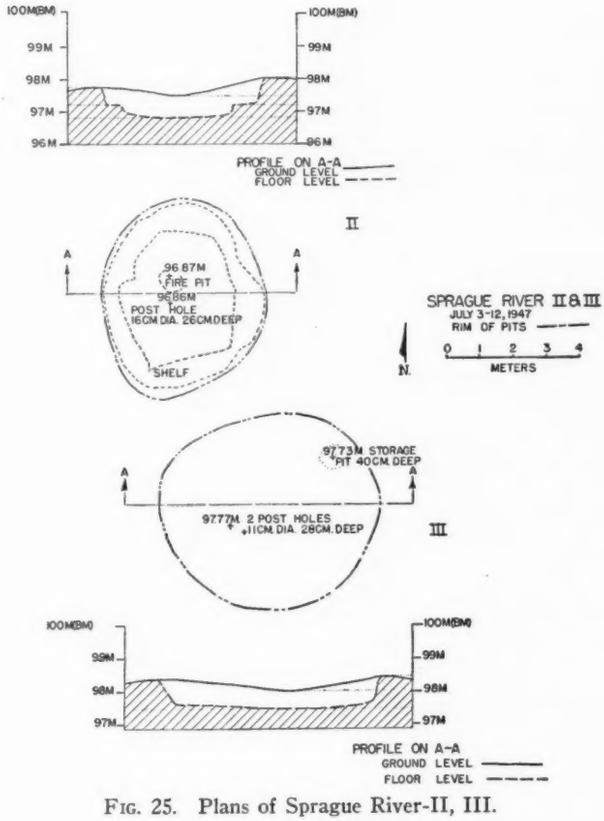


FIG. 25. Plans of Sprague River-II, III.

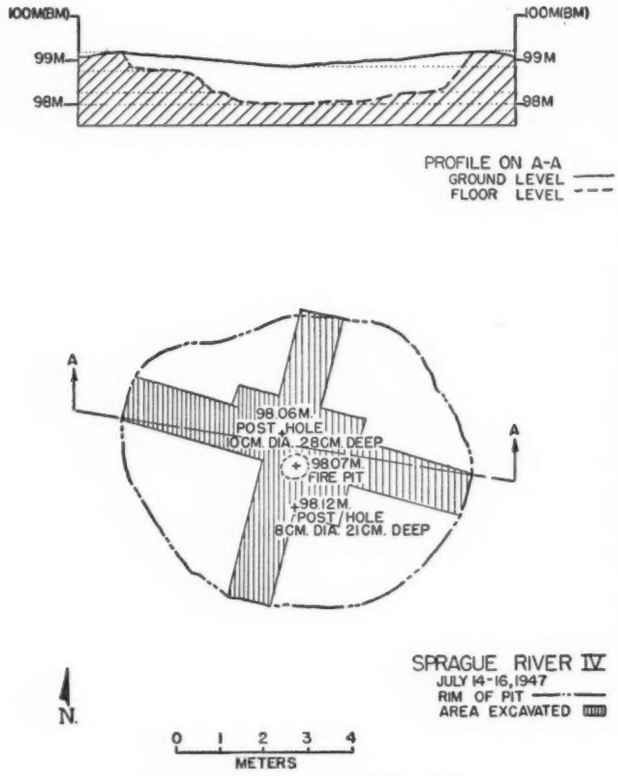


FIG. 26. Plan of Sprague River-IV.

Osborne (1949: 121–152) reports similar problems for the houses in the southern Plateau at the McNary dam site and further north along the Columbia. There were lack of timbers, failure to find postholes, and lack of evidence of entrances.

BENCHES

One of the unexpected and interesting features of the houses was the occurrence of benches. The bench was made by constricting the circumference of the pit and then continuing the excavation. Out of seventeen houses excavated six lacked the bench. Of the six, one was a sweat house, one, KL-11, was probably a very short term shelter and was very shallow, and Sprague River-III may have been a cook house. Gentry I seems to have lacked the bench, but this was the first house excavated and we may have not recognized it. KL-10 was partially excavated by trenching and the picture for that is not too clear. Long-II (fig. 21), which consisted of two superimposed houses in the same pit, certainly had a bench for the early house but there is none clearly shown for the later one. Lalo-II (fig. 23) also consisted of a dwelling later modified into a storage house. The early pit had a bench.

While the usual pattern was to have the bench encircle the pit, in Lalo-I there was a double bench on the north half of the house with none on the other side. These benches were covered with a padding of fibrous peat. It is possible that Long-II had the bench on the north side only. Osborne (personal communication) has told me that they did not find benches in their house pits on the Columbia.

FLOOR SHAPE

All floors show an original saucer-shape contour. Sprague River-III has the most nearly flat floor surface. I am pretty sure this was a large cook house because (1) manos, etc., came from the fill and (2) a large storage pit extended 40 cm. below the floor. I have a feeling, too, that my students at this house were just a little too ambitious in producing a flat floor, but perhaps not. It has always puzzled me how anyone could sleep in any comfort on a floor shaped like these unless he slept stretched out along the radial axis. In contrast with the ethnographic, the archaeological evidence shows the floor is not flat. Osborne (1949: 146) reports the same saucer-shaped pits at the McNary dam site (45-BN-53, RBS code), and as far north as Moses Lake in Washington. Evidently this saucer shape was a well-established pattern and not a product of careless work.

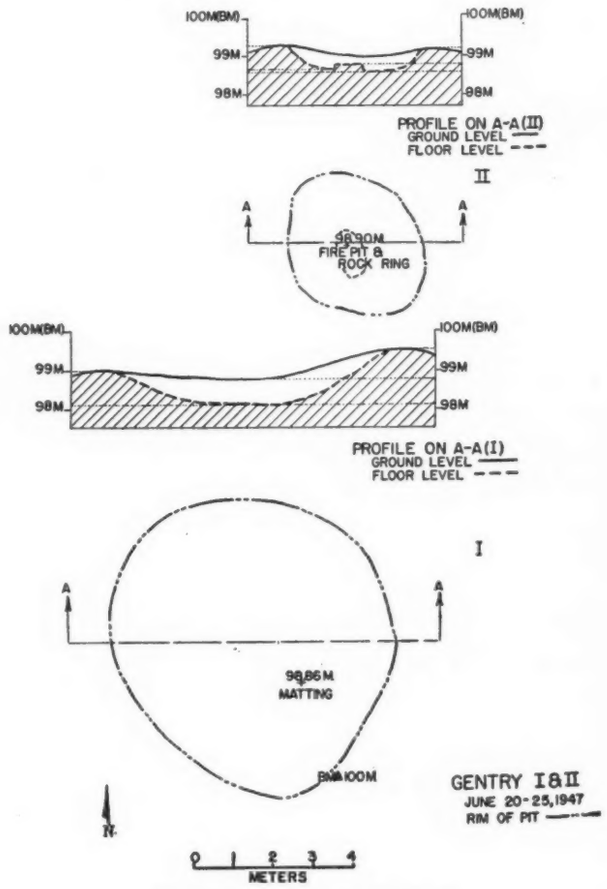
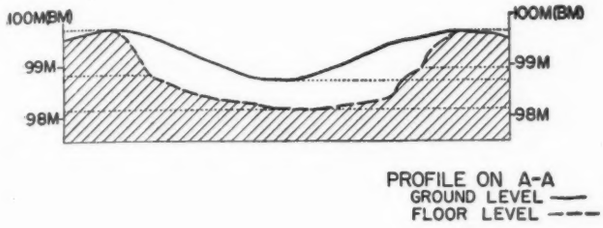


FIG. 27. Plans of Gentry-I, II.



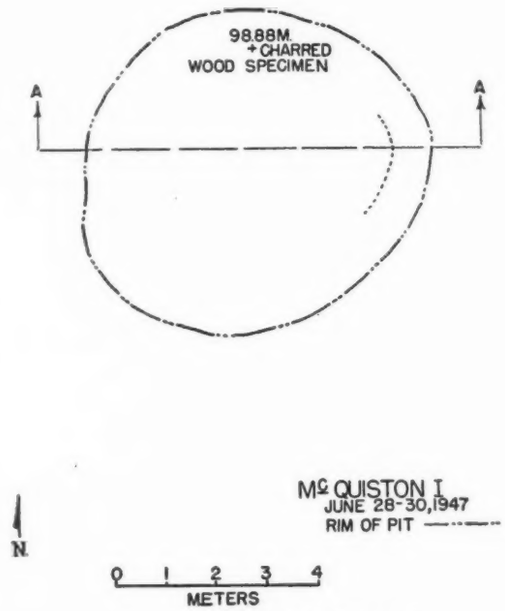


FIG. 28. Plan of McQuiston-I.

ENTRANCES

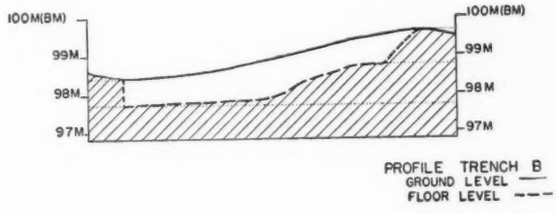
From what has been said above in the discussion of posthole patterns, it is clear that there were probably ladders used to descend into some of the houses through the roof hatchway. One, Sprague River-II (fig. 25) which was rather oval-shaped, had what I am sure was a side entrance on the northeast curve of the house. A step was cut into the bench or shelf, as it is called on the drawing. This entrance would have faced up river toward the canyon and away from the prevailing winds. It has been suggested above that the bench was used as a step down with a side entrance. However, here the entrance was cut down into the bench. This pit was fairly deep for its diameter and the surface on the northeast side sloped down away from the house so that perhaps a cut into the bench was the easiest solution to the problem. Our evidence fails to give us any clear-cut pattern of house entrance. Osborne (1949: 147) could find no entrances at McNary.

RE-USE OF HOUSES

Only two houses show clear evidence of re-use of the pit. Long-II (fig. 21) was built and abandoned after a time. Midden had accumulated in the pit either from being thrown there or by the erosion of the walls, since it had been originally dug into the midden, then a second house was built in the concavity without clearing out the midden. The earlier house was the more substantial one. Lalo-II, as we pointed out, represents a dwelling that was cleaned out after its abandonment and redesigned as a storage house. This pit had been dug out along the face of the bench at a sharp angle to the old floor. Then a series of pieces of bark had been used to face the new wall while the floor was covered with pieces of bark laid in a well-defined pattern (fig. 23). Osborne (1949: 146) reports at McNary extensive re-use of earlier pits without cleaning out the debris from the former use.

BARK FLOOR COVERING

In addition to Lalo-II just described, Sprague River-I, a dwelling, had a bark floor covering or pavement.



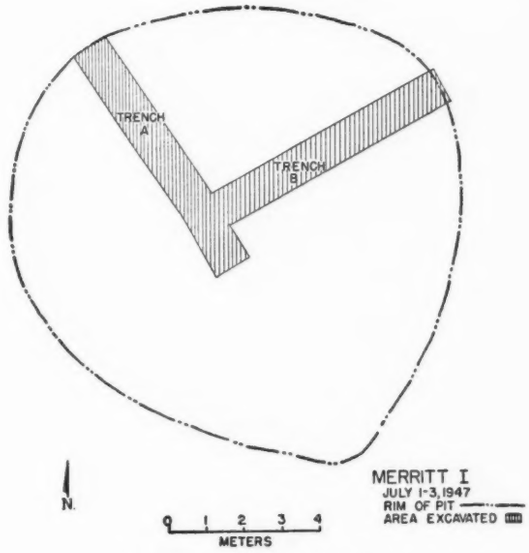
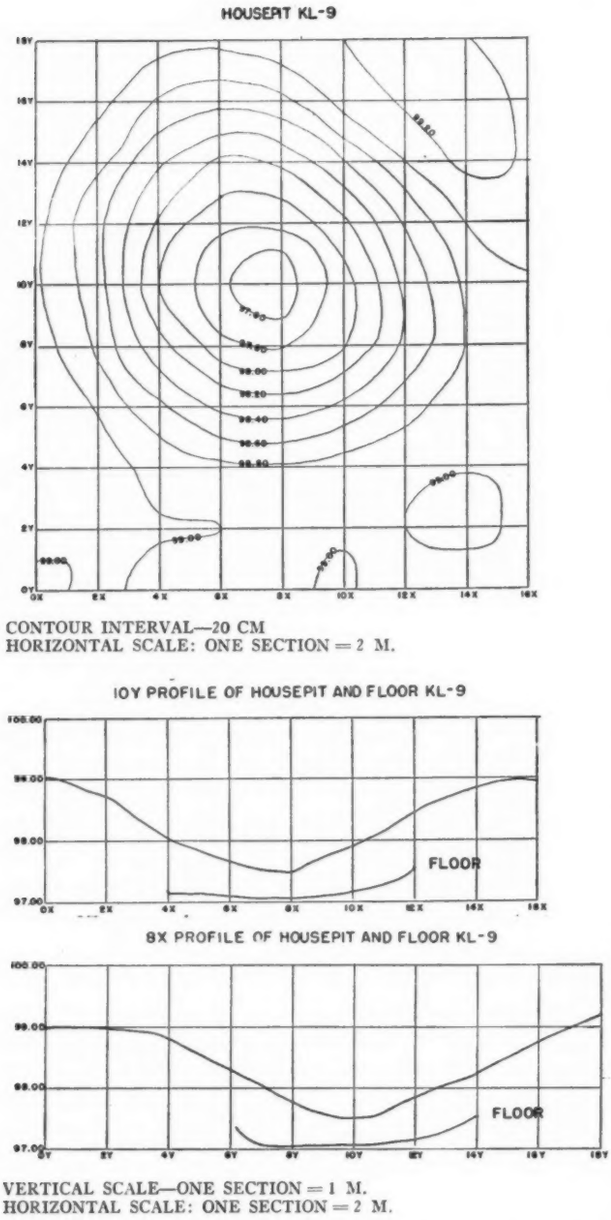


FIG. 29. Plan of Merritt-I.



CONTOUR INTERVAL—20 CM
HORIZONTAL SCALE: ONE SECTION = 2 M.

VERTICAL SCALE—ONE SECTION = 1 M.
HORIZONTAL SCALE: ONE SECTION = 2 M.

FIG. 30. House pit KL-9, contours and profiles showing surface of fill and floor level.

This house had been burned but it was possible to separate out the burned roof material from the bark used for flooring. The latter as found in place was burned only on the upper surface while the former was burned on both sides. Teit (1900) reports the use of bark floor covering for the western Thompson as a device to keep the house dry. Plank floors are found in some places along the coast but the practice does not appear to be general there. These two houses were the only ones to show this character clearly. KL-9 had several wide slabs on the floor, but it is my opinion that these came from the collapsed roof.

METHOD OF CONSTRUCTION

Only KL-9 had enough timbers in place on the floor to permit an attempt at the reconstruction of the house structure. Several others had considerable roof debris on the floor but this indicated only the kinds of materials used, especially as it was usually burned rather badly. Sprague River-I showed that pine boughs, bark, twigs, and mats were all used for roof covering, a combination that must have been a great fire risk. Sprague River-II had a number of large stones that must have been used to hold down mats, for they were intrusive. KL-9, on the other hand, while it too had been burned, had a number of timbers in place on the floor. Apparently the house as it burned collapsed and the overburden of roof debris smothered much of the fire. Figure 31 gives the plan of the house and the location of the timbers. All measurements are to scale. A timber or joist seems to have extended along the long side of the hatchway from post to post. No specific piece could be sorted out on the other site to match this one because of the degree of burning in that area. Then rafters ran to the surface outside the excavation. On these, at right angles to them, were laid large, thin planks. These were not bark but solid parts of wood. These pieces must have covered the entire framework of the roof and were in turn covered with binding materials and finally dirt. This house was the most substantial one we excavacted, and, in view of its size, must have belonged to some family or person of importance, perhaps a shaman, who could afford to build it according to the best pattern. Certainly no other showed any evidence of equal care in the selection of materials. How these large, thin planks were prepared is unknown, but it is possible that they are pieces naturally broken from a tree in storm damage (fig. 39-3), or else they were split off with an elk-horn wedge. At any rate, I think it is safe to infer that this structure represents a close approximation to the ideal pattern described in the ethnographic sources, while the rest of our houses show the variation involved in the behavioral patterns.

SWEAT HOUSES

Gentry-II (fig. 27) was the only clearly defined sweat house found. It was small, a little over 2 meters in diameter at the floor level, and about 0.5 m. deep. In the middle was a pile of thermally cracked rocks just over 50 cm. in diameter and 25 cm. high. There was no evidence of any timbers, a situation to be expected for this type of structure. This house was close to Gentry-I and only a short distance from the Williamson River. Both the circular and the rectangular types with gable ends are reported for the Klamath (Spier, 1930) and this is obviously the former type.

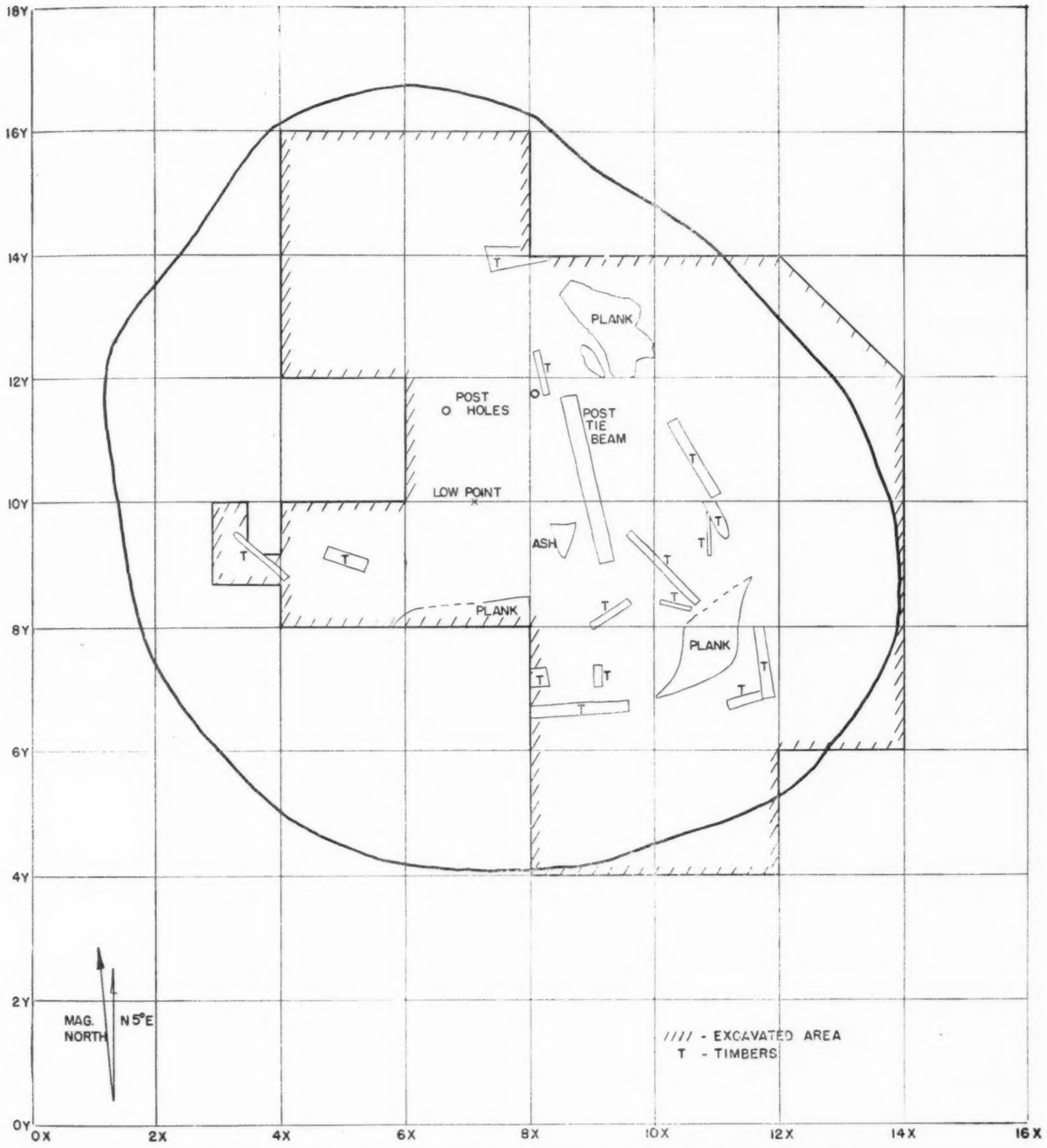


FIG. 31. House pit KL-9 showing location of timbers on floor. Scale—one section = 2 m.

KLAMATH MARSH

At the south end of Klamath Marsh, extensive village sites have been reported by Spier (1930), and scattered villages were also indicated further north along the east side. We had planned excavations in this area, but the reluctance of the Klamath Council to give us permission to work on tribal property in 1949 caused us to abandon this program.

KAWUMKAN SPRINGS MIDDEN HABITATION SITES

While the midden has been discussed as a separate part of the record, it seems wise to introduce here the

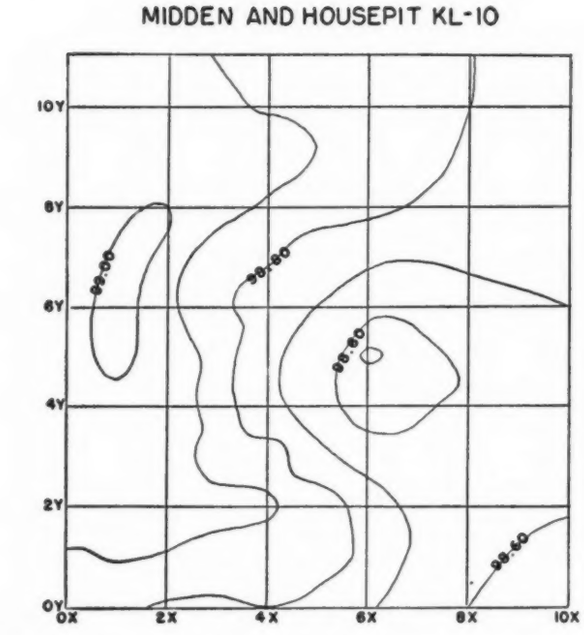


FIG. 32. Midden and house pit at KL-10.

evidence for dwellings found in the midden since it contrasts strongly with the later material and it has chronological significance. Figure 2 shows the horizontal plan of the excavation from 2X to 40X and between 0Y and 2Y, and the profile along 2Y from 2X to 40X. In this area was found a series of four artificial platforms built up out of stones of varying sizes (fig. 4). Since the deposit is all midden, these platforms were obviously artifact material. Further, they all occur in the early part of the midden's use. None were found in the trench that ran at right angles to this. Figure 57-1 shows the appearance of the one between 32X and 32.5X. While the surfaces of these constructions were not completely level they may well have been at the time of use, especially if covered with grass and mats or some such materials. Among these stones were found manos, both good and broken ones. Near the center of the one between 8X and 12X was a fire lens. The large combination tool (fig. 46-7) was found along with other artifacts on the top of the one between 32X and 34X. The presence of the ash lens, of housekeeping equipment mixed with the surface stones, and the generally level character of the constructions strongly suggested that these were living areas. The evidence of housekeeping led us to call them kitchens, as is done in figure 4. If these were habitations, as I believe they were, then they must have been covered by some rather fragile frame and mat materials. Again their location suggests a definite pattern of arrangement with reference to the spring and river. The use of stone platforms could have been to provide a solid and dry base, if covered with grass and mats, in the soft midden material that at this time was very shallow above the underlying sandstone. Long IV extends over the margin of the one at 32X–34X, but was built a very long time afterward. There was little soft dirt into which to dig a pit even were there a pattern for that kind of house when these platforms were built.

The platform at 32–34X gives us chronological data. About 20 cm. under the bottom were found the skeletons of two adolescents who had been killed by blows at the base of the skull and thrown together into a grave. Then the platform was built sometime afterward continuously over the area. In the middle of the top of the platform was an adult male burial in a grave made by removing the stones at that point. This skeleton had in the lower left abdominal region a large bone foreshaft, bevelled at the proximal end as those reported for the Early Period at Lower Klamath Lake (Cressman, 1942) and given a minimum date of 7,000–7,500 years ago. If our dating is correct for this type of bone projectile point, then these platforms were in existence before the onset of the altithermal, or before 7,000–7,500 years ago.

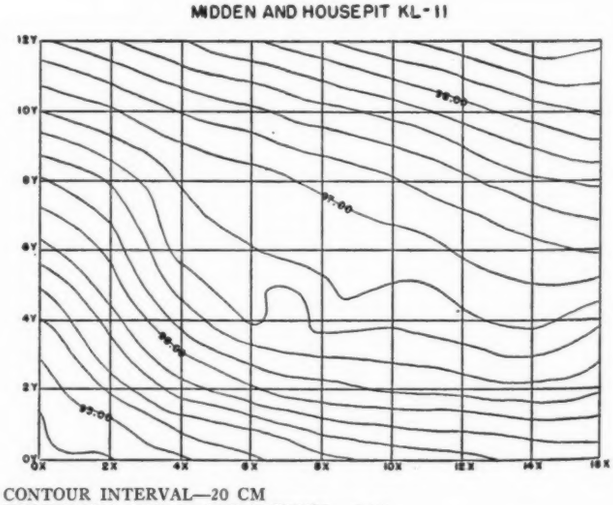
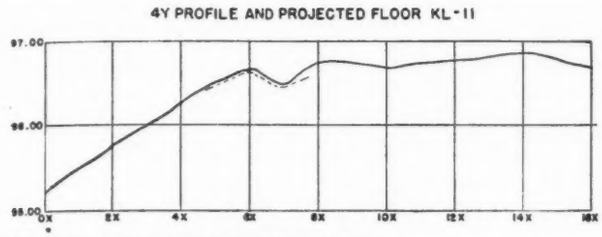


FIG. 33. Midden and house pit KL-11.



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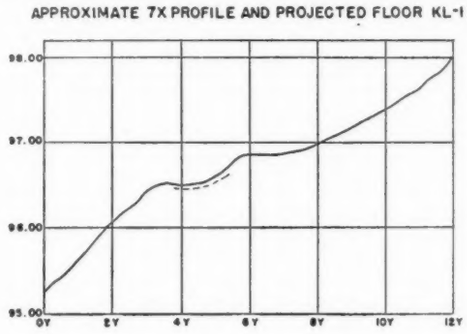


VERTICAL SCALE—ONE SECTION = 1 M.
HORIZONTAL SCALE—ONE SECTION = 2 M.

FIG. 34. Profiles of Midden and house pit KL-11.

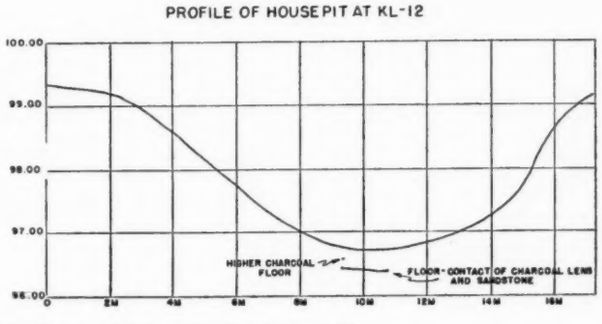
There is plenty of evidence elsewhere in the midden, as I shall show later, to indicate living and working, but there is no evidence of any house pit associated with the materials.

CHRONOLOGICAL RELATION OF THE VILLAGE SITES

Since the chronological picture has to depend to a large extent on the artifact association with the house pits, any detailed discussion of that point should be deferred until the artifacts have been discussed. However, here it may not be out of place to anticipate somewhat that discussion for the sake of the order such information will add to the picture. From ethnographic sources and the artifacts found in Gentry-I and at the Sprague River sites, these villages would belong to the immediate precontact period. How far back the occupation of the sites might have gone there is no way at present of knowing. The villages back on the ridge and in the timber above Kawumkan Springs, KL-9, KL-10, and KL-11, would probably have been contemporary with the down river villages. The occupation of the Long-Lalo series would have terminated before the establishment of the adjacent villages just mentioned. Then the earliest date would be represented by the stone platform dwellings of the early stages of the midden. I am sure, however, that a long period, for which I have no evidence of the nature of the houses, elapsed between the time of the stone platform dwellings and the first house pits in the midden. The detailed evidence upon which this summary statement is based will be given later in the discussion of the chronology for the area as a whole.

SUMMARY

The houses in the Klamath village of immediate precontact time and from earlier periods do not show any pattern of placement with reference to one another. The villages are usually situated on a terrace or bench above the river, possibly to avoid flood damage or perhaps because there the soil was soft and deep enough to permit digging foundations with their limited tools. Frequently the villages (winter) were close to some feature of the river which guaranteed the possibility of fishing during the winter season when there was likelihood of the river freezing. Riffles, springs, or the confluence of a feeder stream provided a good chance that the river would stay open. The pattern of the structure of the houses shows a generally circular floor plan although the north-south axis is usually a little longer than the other. Floors are the shape of a shallow saucer. Most of the houses have a bench or shelf set a short distance down from the surface which in most cases runs around the house. Postholes occur only in a few of the houses. Six of the houses were destroyed by fire, perhaps set accidentally or else burned after the death of an occupant. The evidence for entrances is confused with some houses suggesting a ladder entrance through the roof hatchway and at least one suggesting a side entrance. KL-9, the largest excavated, was also the most substantial. It, more than any other, conformed to the pattern described by Spier's informants as the type for the Klamath house. The archaeological evidence shows a distinct variation in detail from the pattern set up in ethnographic sources. It is inferred that the ethnographic pattern is the ideal one and the archaeological data show the behavioral variation. Finally there is a sequence of occupation but no clearly definable difference in the house types in the area over a long period of time, but the evidence from the early period of the Kawumkan Springs Midden shows a completely different type of habitation. The hiatus between that period and the earliest house pits, those on this midden, the Long-Lalo series, cannot at present be filled in. It cannot be said whether the



VERTICAL SCALE—ONE SECTION = 1 M.
HORIZONTAL SCALE—ONE SECTION = 2 M.

FIG. 35. Profile of house pit KL-12.

house pit type of structure was developed here or was diffused into the area from elsewhere or brought by a migrating population.

VII. ARTIFACTS FROM THE HOUSE PITS

Ethnological sources and artifact types indicate that the pits in the surface of the Kawumkan Springs Midden are the earliest in our series. It is impossible to establish any time for the other pits with the exception of KL-9 for which there is a C-14 date of 430 ± 165 (Libby, 1954: 739) except that they extended from some period in the precontact to contact times. In the following discussion the Kawumkan series will be discussed first to be followed by those from the Williamson River and last from the Sprague River. The last two sites are separated from each other by about four miles at the most. The Sprague River series was least affected by the agricultural and industrial development of the area and consequently provides the better manifestation of artifacts. These two sites are accepted as contemporaneous and are separated only for the purpose of discussion and then on a geographic basis. KL-9 and 11 produced so few artifacts, and these of a precontact type, that they are not included as they add nothing significant to the discussion.

THE KAWUMKAN SPRINGS HOUSE PIT ARTIFACTS

It was impossible to separate the late fill from the earlier in these house pits so all specimens from each pit are given in the inventory in Appendix A. Types of all specimens except small scrapers are illustrated in the plate for each series. The portion of the midden where Lalo-I and II were located had been used as a corral and beef had been butchered there from time to time. In addition, from before to after contact times, children had played over the midden in general and in the pits in particular as has been previously pointed out. These uses of the midden would account for the presence of iron tools, beads, cartridge cases and such in the fill.

LONG-I

Figure 62 shows the variety of artifacts from this pit. The main difference between this assemblage and the earlier midden artifacts lies in the increased range of the grinding tools or manos found here. Heretofore there were only manos and pestles and in the mano series there was only the widely used rather flat oval hand stone and a somewhat better shaped one made from pumice. Here there are two new innovations. One, number 18, has incipient "horns" illustrating the first of the two-horned series. The horns are stubs but clearly defined. When compared with the developed form (fig. 50-5), the inference seems justified that we are dealing here with an early form of this type of instrument. A bell-shaped specimen (figs. 12-4, 50-4) also occurs here. A third new kind is one with a groove around the wall for a finger grip, no. 19. No. 32 illustrates a fourth new kind, raised on the hand surface to almost a hemispherical shape but with the point off the center of the long axis. This may be related to the type Barrett described for the Klamath, flat on the base with a hemispherical upper surface (Barrett, 1910: pl. 21, fig. 1). The implication of this series of innovations in grinding tools can only be that either new seeds were being used for food or else new instruments were being developed for better preparation of established types of foods or both. The presence of mano-metates throughout the midden clearly indicates the habit of seed use even though there is no change in the type of manos used. The other artifacts from the house pit show no change from the varieties in use in the midden. Probably, then, what happened between the time of abandonment of the midden and its final re-use by the people who made the pits was that a process of experiment went on to develop instruments with which they could better prepare their seed foods, and in this case by inference from the ethnographic picture we can deduce that the seeds were those of the *Wocas*. This statement is not to be taken to indicate that the *Wocas* was not eaten earlier but only that a new variety of tools were being developed in its preparation.

Figure 62-22 illustrates a longitudinally grooved shaft polisher of basalt. Compare Barrett's pl. 21, fig. 9. A similar specimen came from Level I of the midden although it is somewhat narrower across the base than the house-pit piece. This type of tool, characteristic of the Northern Great Basin, is well established in the Klamath area. Nos. 9–17 show a variety of "hotrocks." No. 29 is a fine chopper made from a large flake of black obsidian. The rest of the illustrated stone specimens are grinding tools or fragments of various kinds, except the two knives and drill, Nos. 6, 7, and 8, respectively. No. 1 is a fish gorge, 2, possibly a point for a two-pointed fishhook, 3, an antler flaker, and 4 is a flesher made from a ground down long bone. No. 5 is a slotted piece of long bone possibly used to work down sinew cord into final condition.

The comparison of these specimens with those described from the midden shows clearly that the only break between the two series is in the new types of grinding tools, variations of the mano, which are added to the housekeeping inventory by the house pit occupants. We have continuity from the past but innovation in types for a more satisfactory adaptation to the environmental possibilities.

LONG-II

Long-II shows much the same inventory as Long-I lacking, however, the two-horned type of mano. Figure 63-22 shows a mano raised on one side but this specimen has more of a transverse ridge than no. 32, fig. 62.

It undoubtedly served the same purpose, to give a better grasping surface for more efficient control of the pressure exerted with it. Compare this specimen with no. 14, fig. 67, from the later Sprague River site. No. 29, fig. 63, shows a well-developed hemispherical mano as previously described; only it is much better made than no. 32 from Long-I. There is no point in further discussion of the artifacts from this pit since they are so much like those from Long-I which have already been discussed.

LONG-IV

Figure 64-1 may be a bone harpoon point but it is not certain. The balance of the series corresponds to those already described, including a similar shaft smoother, no. 16.

LALO-I

This pit and the next were the ones in the corral area, and figures 65 and 66 show the conglomeration of material from the fill. Figure 65-8 is probably a powder can. No. 17 is undoubtedly some kind of a butchering instrument but we have been unable to have it identified. The other metal pieces are quite easily identifiable. No. 10 is probably a stone club head although there is a possibility it might have been a net weight. It is slightly grooved and has a shallow hole which could have been used for a knot or the end of a handle. This is the house pit which had two benches padded with peat one above the other extending half way around the house.

LALO-II

Figure 66 has about the same mixture of materials as Lalo-I. No. 1 is a shaft polisher, probably not finished, made from scoriaceous basalt and grooved on both upper and lower surfaces. Otherwise it is like the other smoothers. This house with the bark floor covering had been built over an earlier one. There were no artifacts associated with the earlier pit.

WILLIAMSON RIVER HOUSE PITS

GENTRY-I

This pit on the Williamson River contained only three artifacts (fig. 68). The can, no. 1, contained pitch which could have been used for starting the fire or for hafting harpoon points, fish gorges, etc. No. 3 seems to be a piece of diatomite and was possibly a block for making a pipe bowl. The other pits excavated on the Williamson River produced no artifacts. Gentry-I is in the pine forest which was lumbered about 1917. The areas of the villages in the open fields have been farmed and all signs of house pits obliterated. However, many characteristic precontact Klamath artifacts are turned up by the plow. The two-horned mano in figure 50-5 comes from one of the fields adjacent to Gentry-I.

SPRAGUE RIVER HOUSE PITS

SPRAGUE RIVER-I-IV

House pits I–III were all adjacent and formed part of the village site on the east bank of the Sprague about four miles upstream from its confluence with the Williamson (fig. 38-6). Sprague River-IV was on the bluff on the south bank of the Sprague just above where the two rivers join. They are grouped here for this discussion. These were villages recorded by Spier and apparently in use at the contact period. There were no pieces of metal from these pits, so it is possible that they were not used after contact as was obviously the case with the Williamson River house, Gentry-I, down that stream from the confluence. Figure 67 illustrates the Sprague River artifacts.

The grinding tools from this site cover almost the whole range of Klamath types, and if no. 19, fig. 67, can be taken as a variation of the bell-shaped type of mano, then the entire range is covered. No. 9 is a two-horned mano but one horn seems to have been broken and reworked. No. 11 is a hemispherical type; 13 has a rounded but not quite hemispherical shape; 14 (from Sprague River-IV) has the transverse ridge; 15 has a groove for the finger tips. No. 17 is slightly rounded on both surfaces and highly polished. It could have been a piece of river gravel picked up and carried in to the site to use as a cooking stone or even as a grinding stone of some sort.

No. 18 is a maul lacking the top portion. It is illustrated in figure 69 where the decoration shows much more clearly. This was probably used for driving wedges as well as pounding with the bottom surface, which shows some scarring. There is a decorated band nearest the top with a running chevron design, and after a blank zone a lower zone with vertical lines cut into the surface. The chevron design occurs frequently in the Northern Great Basin. No. 19 may be considered a modified bell-shaped grinding tool or a pounder. It has a slight bulbous proximal end for a handle. Obviously it could have been used for pounding wedges either of antler or wood.

SUMMARY

The artifacts from the house pits show a continuity of the traditions in stone work from the midden, although there is the possibility of a discontinuity between the end of the midden occupation and the establishment of the Kawumkan house pits. How long this discontinuity was, if it existed, cannot be determined. Excavation in 1951 in house pits back in the timber from the midden and a few hundred yards down river on both banks failed to produce any significant collection of artifacts that might have helped with this problem. The projectile point types continue as the plates show with the small ones dominating in the Sprague River site. The older type of mano continues. The

midden form of shaft smoother continues. The significant change is in the increase of varieties of grinding stones (fig. 13), presumably for better exploitation of the *Wocas* resources. These types appear first in the Kawumkan house pits where they seem to be tentative attempts at an effort to improve their technological equipment. These innovations could be considered either as internal in origin or introduced from the outside. Since the two-horned mano is distinctive of the Klamath area, there is little ground for looking for external sources for origins. The evidence indicates that the innovation was internal in origin and this is the more interesting in view of the little change that occurred in tools and instruments throughout the long period of the occupation of the midden. At any rate, what we have here is a clear cut record, stratigraphically documented, of the development of some of the most distinctive and significant articles of Klamath culture.

VIII. THE FOOD ECONOMY AND ECOLOGICAL ADAPTATION OF THE MIDDEN POPULATION AS IMPLIED BY THE FOOD HABITS

THE BASES FOR INFERENCE

At the archaeological level there are two kinds of data on which inferences about the food economy of a population may be built. These are the direct and the indirect evidence. Inference may be drawn from the known use of artifacts in the historic phase of a culture concerning the use of similar objects at the prehistoric level if done with due regard for possibilities of change in use during the passage of time. This latter method should be classed in the indirect category.

The direct evidence consists of the remains of food animals and food supplies. This will consist of bones, sometimes other organic remains under favorable circumstances, seeds in storage pits or receptacles, and prepared food supplies such as ground seeds and roots. Sometimes human feces will offer evidence of the food habits of individuals.

The indirect evidence consists of the utensils and tools which have limited uses from which inference may be drawn. Manos and metates and mortars and pestles indicate that certain kinds of foods were prepared by pounding and grinding but they do not tell what kinds of foods. It is necessary to draw on other knowledge, such as the stage of development of the culture, the general ecological situation, and suggestions from comparable historic sources. A well-developed knife or scraper technology may reasonably be related to a hunting economy in which large animals had to be butchered. Small, poorly defined scrapers would be satisfactory for cutting up fish, small animals, and mussels but would be of little use to hunters of large mammals.

LIMITATIONS ON INFERENCES

Various kinds of limitations restrict the completeness of the data on which inference may be based. The direct evidence may be limited in the site because methods of disposal required that the refuse should be deposited outside the living area and the location is not discovered by the excavator. The methods of disposal may change through time. For example, on the Columbia River for some distance east of The Dalles in protohistoric times it was customary to throw the refuse in the river. There was some ceremonial significance to this and perhaps sanitary as well. In our excavations at Five Mile Locks, Site WS-4 (unpublished material) the upper levels are devoid of bones of all kinds. As the fill goes down in depth bones begin to appear and then in the early stages of use there is a heavy complement of bones of a wide variety of food animals. About the only kind of check on this situation is the internal evidence from the deposits.

Then the preservation of bone material may be selective, that is, one expects the heavier bones, such as those of large mammals, to outlast the small, fragile ones like those of fish. In general this is sound enough so that if fish and bird bones are found and very few of those of the larger animals one may legitimately infer that the larger bones were not there to begin with.

The preservation of indirect evidence is also selective. Stone utensils will in general be preserved but wooden ones such as traps, fibre with which nets are made, certain types of projectiles made from wood to shoot birds on the water will all disintegrate in open sites exposed to moisture. Dry caves will, of course, provide better preservation for both direct and indirect evidence than will an open site. I shall now proceed to the evidence, first direct then indirect, for the food economy of the midden population.

THE FOOD OBJECTS: THE DIRECT EVIDENCE

MUSSELS

One of the most important sources of food for the midden inhabitants was the mussel found in profusion in the Sprague and the Williamson Rivers. Spier (1930: 155) writes: "To judge by the quantities of fresh-water clamshells at the old house sites clams are also an article of diet." Great quantities of mussels must have been eaten to judge from the fragments throughout the entire midden. The shells were apparently thrown out indiscriminately and walked over so that they were broken into small fragments. In some areas the concentration was more apparent than in others (fig. 7). In some areas only the chitinous outer covering of the shell remained. The calcium carbonate had dissolved out and acted as a cementing agent in the fill. Much of the fill, especially if damp, would, when exposed to the sun for a day, become extremely hard. A grayish color characterized much of the fill after ex-

posure and this is probably due, in part at least, to the calcium carbonate. The agent of mineralization in the bones is also calcium carbonate. There is no way to give any statistical indication of the importance of the mussel as a food object but the estimate based on observation of the conditions is that it was one of the leading food sources.

The other animals used for food as indicated by bones are fish, birds, game (meaning large mammals such as deer), rodents, and carnivores. Of this series the first three are certainly food animals while the other two are less certain. However, the material is presented in two ways: one includes the entire series and the other is limited to fish, birds, and game. Each series is handled as a total of 100 per cent and then analyzed from that base. It should also be pointed out that each bone or fragment that did not fit any other piece is treated as a single unit. This method may be open to question but there is no way of determining how many animals were used from the various specimens of bones. There is no way that I know of to weight satisfactorily a deer, a mallard duck, and a salmon. It is more likely that, if a long bone of a deer is broken into several pieces to extract the marrow, the fragments have a better chance of survival in the midden than say the vertebra of a salmon or the fragile bone of a bird. Since the game bones were broken, we are more likely to have an unjustifiably larger sample of game animals than the original situation would warrant.

Small rodents were used for food but to what extent is impossible to determine from the archaeological evidence. Since rodents die in a midden these remains may be confused with food debris. The only way this problem could be solved would be to separate out those skeletons of rodents found in nests or those which were complete. This kind of result cannot be achieved where the dirt is shovelled into a sieve and then worked over.

To what extent carnivores were eaten cannot be determined. It is possible that they were not and that the bones are those of animals killed and brought in for their hides or some other purpose. Since food supplies were frequently scarce in the winter it is possible that almost anything edible would be eaten.

Table 9 shows the actual numbers of bones and the percentage distributions by Levels and differences from the average per cent for each of the five categories. The material, deviations from the average, is presented graphically in figure 36-1. Corresponding data are presented for the three categories of food animals in table 11 and by figure 37-1. The material in each case is first presented for each category for all Levels as 100 per cent, for example fish. The data are also given by original and adjusted counts. The figures in each case present the data for each Level in points above (+) or below (−) the average percentage for all Levels. Then the evidence of variation in incidence of bones within levels will be examined. Dr. J. Arnold Shotwell, Curator, Museum of Natural History, made the identification and classification of bones by these categories.

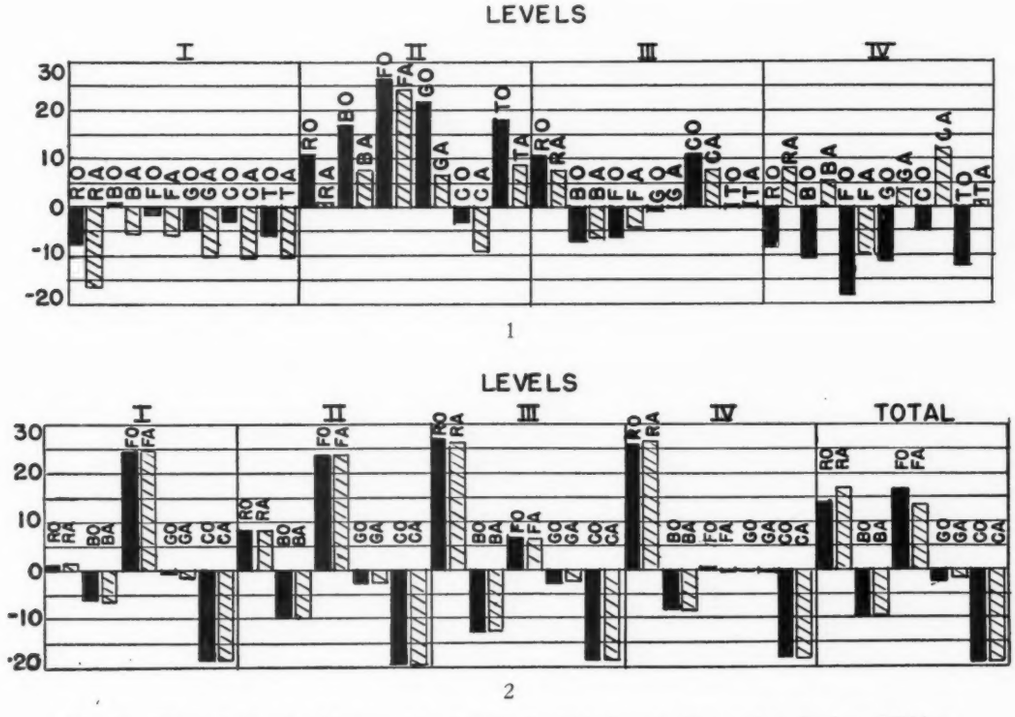


FIG. 36. Unworked animal bones: 1 by Levels, 2 within Levels, Kawumkan Springs Midden.

FISH, BIRDS, GAME, RODENTS, AND CARNIVORES

Figure 36-1 shows that Level II has a greater percentage of food remains than any other. On the basis of the original figures the rodents are about equal in Levels II and III and both positive. Carnivores in Level III are in about the same position as rodents but in Level II are negative. The adjusted figures show rodents strongly positive in Levels IV and III but only slightly so in II and strongly negative in I. Carnivores also show a similar change. Fish appear as a minor item, both original and adjusted, in Level IV, somewhat more important in III and of primary importance in II while in I they are second in importance to birds but next in importance to Level II in the overall picture. The heavy accent on fish in Level II makes the percentage in I low.

Birds follow the same pattern as fish except that they are slightly in excess of fish in Level I. In general the overall picture is the same, except that in Level IV the adjusted value for birds becomes positive.

Game animals, which in Level IV are negative in the original, become slightly positive when adjusted, show little variation from the average in Level III but are strongly plus, second to fish in II and negative in I for both original and adjusted values.

Certain inferences may be drawn from these data. During the period represented by Level IV the adjustment to the use of fish had not taken place. The process was gradual with complete adaptation represented in Level II. In Levels IV and III, if we take the adjusted figures, the range of food animals was wider than in the succeeding Levels. Concentration on a more limited range had taken place by Level II. It is probable that the greater number of bones in Level II is indicative of the population changes we suggested earlier as taking place during the time covered by that Level. The accent on game animals in contrast to their occurrence in the other Levels may also indicate that the newcomers were more active hunters than the people among whom they came. The conditions represented in Level I may indicate a shift in food habits or a population decline.

If we examine the data by each Level as 100 per cent we shall see the emphasis on various kinds of food animals for that period, since it is considered as a unit.

Figure 36-2 shows the deviations in percentage points from the average percentage of each of the five series of animals and table 10 gives the values from which the graph is derived. Level IV shows a heavy accent on rodents with fish only slightly positive. All others are negative. Game animals differ slightly from fish. In Level III rodents are slightly more positive than in the previous level but fish are now strongly positive, although only about one quarter as much so as rodents. Level II shows fish in a strongly preferred position and rodents have dropped to approximately the relative position held by fish in the previous Level. In Level I fish are slightly more important in the series than they were in II while rodents have decreased and birds have gained slightly in favor.

TABLE 9

UNWORKED BONES. NUMBER AND PERCENTAGES OF EACH TYPE BY LEVELS, ORIGINAL AND ADJUSTED AND DEVIATION OF EACH LEVEL FROM AVERAGE PERCENTAGE

	I		II		III		IV		Total		I	II	III	IV
	No.	%	No.	%	No.	%	No.	%	No.	%	+, −	+, −	+, −	+, −
Rodents	166	12.2	494	35.9	485	35.2	231	16.8	1,376	100.0	− 7.8	+10.9	+10.2	− 8.2
Adjusted	163	8.5	494	25.8	620	32.4	639	33.3	1,916	100.0	−16.5	+ 0.8	+ 7.4	+ 8.3
Birds	109	26.0	175	41.7	75	17.9	60	14.4	419	100.0	+ 1.0	+16.7	− 7.1	−10.6
Adjusted	104	19.2	175	32.4	98	18.2	163	30.2	540	100.0	− 5.8	+ 7.4	− 6.8	+ 5.2
Fish	345	23.1	768	51.4	278	18.6	102	6.9	1,493	100.0	− 1.9	+26.4	− 6.4	−18.1
Adjusted	339	19.5	768	44.2	359	20.7	271	15.6	1,737	100.0	− 5.5	+19.2	− 4.3	− 9.4
Game	148	20.2	303	41.7	176	24.3	100	13.8	727	100.0	− 4.8	+16.7	− 0.7	−11.2
Adjusted	143	14.9	303	31.7	238	24.9	272	28.5	956	100.0	−10.1	+ 6.7	− 0.1	+ 3.5
Carnivores	11	22.0	11	22.0	18	36.0	10	20.0	50	100.0	− 3.0	− 3.0	+11.0	− 5.0
Adjusted	10	14.4	11	15.7	23	32.8	26	37.1	70	100.0	−10.6	− 9.3	+ 7.8	+12.1
Total	779	19.1	1,751	43.0	1,032	25.2	503	12.7	4,065	100.0	− 5.9	+18.0	+ 0.2	−12.3
Adjusted	759	14.5	1,751	33.6	1,338	25.6	1,371	26.3	5,219	100.0	−10.5	+ 8.6	+ 0.6	+ 1.3

TABLE 10

UNWORKED BONES. NUMBER AND PERCENTAGES, WITHIN EACH LEVEL, ORIGINAL AND ADJUSTED, AND DEVIATIONS OF EACH FROM AVERAGE PERCENTAGE

	I		II		III		IV		V*		Total (I–IV)		I	II	III	IV	Total
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	+, −	+, −	+, −	+, −	+, −
Rodents	166	21.2	494	28.3	485	47.0	231	45.9	(5)		1,376	33.8	+ 1.2	+ 8.3	+27.0	+25.9	+13.8
Adjusted	163	21.5	494	28.3	620	46.3	639	46.6			1,916	36.8	+ 1.5	+ 8.3	+26.3	+26.6	+16.8
Birds	109	14.0	175	10.0	75	7.3	60	11.9	(4)		419	10.3	+ 6.0	−10.0	−12.7	− 8.1	− 9.7
Adjusted	104	13.7	175	10.0	98	7.4	163	11.9			540	10.3	− 6.3	−10.0	−12.6	− 8.1	− 9.7
Fish	345	44.3	768	43.8	278	26.9	102	20.2	(4)		1,493	36.8	+24.3	+23.8	+ 6.9	+ 0.2	+16.8
Adjusted	339	44.7	768	43.8	359	26.8	271	19.7			1,737	33.2	+24.7	+23.8	+ 6.8	− 0.3	+13.2
Game	148	19.1	303	17.3	176	17.1	100	20.0	(5)		727	17.9	− 0.9	− 2.7	− 2.9	0.0	− 2.1
Adjusted	143	18.8	303	17.3	238	17.8	272	19.9			956	18.4	− 1.2	− 2.7	− 2.2	− 0.1	− 1.6
Carnivores	11	1.4	11	0.6	18	1.7	10	2.0	(0)		50	1.2	−18.6	−19.4	−18.2	−18.0	−18.8
Adjusted	10	1.3	11	0.6	23	1.7	26	1.9			70	1.3	−18.7	−19.4	−18.2	−18.1	−18.7
Total	779	100.0	1,751	100.0	1,032	100.0	503	100.0	(18)		4,065	100.0					
Adjusted	759	100.0	1,751	100.0	1,338	100.0	1,371	100.0			5,219	100.0					
Bird, fish, and game—original		77.4		71.1		51.3		52.1									
As per cent of total—adjusted		77.2		71.1		52.2		51.5									

* Not included.

Game animals make their best showing in Level IV. This may seem to be in conflict with the previous statement of the increased use of game in Level II. Such is not the case because that comparison was on the relative use of game by Levels. Here the comparison is by types within each Level. We thus get a picture of relative preferences within each Level and this shows a slight increase in the preference for game from Level III to Level I after the drop from Level IV. The increasing preference for birds and fish with the decrease for rodents is notable.

In the overall food picture for each Level carnivores add very little to the supply.

The adjusted figures make little difference in this series and need not be discussed.

I think the evidence from figure 36 strongly indicates that the rodents were food animals. If the rodent bones were only the remains of those animals which had died naturally in the midden then how are we to account for the great differences of rodent bones by Levels? The adjusted figures, which eliminate the variable of amount of dirt excavated, correspond very closely with the original. If rodent use of the midden were heavier after it was abandoned and the bones were the result of natural death then we should expect the upper Level, I, to have the heaviest concentration. This is not the case by either system of measurement. Further, one might expect that those in the earth longer would have been more subject to decay than others. In this case the percentage should have increased toward the surface. This again is not the case. The only other possible explanation would be to posit a change in rodent population throughout the life of midden. What the logical grounds might be for such an assumption is not clear. On the basis of the evidence the only supportable inference that can be drawn is that rodents were a very important article of diet during the first two Levels of the midden's history but that they declined strongly and progressively during the latter periods. Looked at from these five possible sources of food the habits of the occupants went through a significant change which started in Level III and became mainly stabilized in Level II centering about the use of fish. Game animals increase slightly in preference but are never an important item. The use of birds appears as below that of

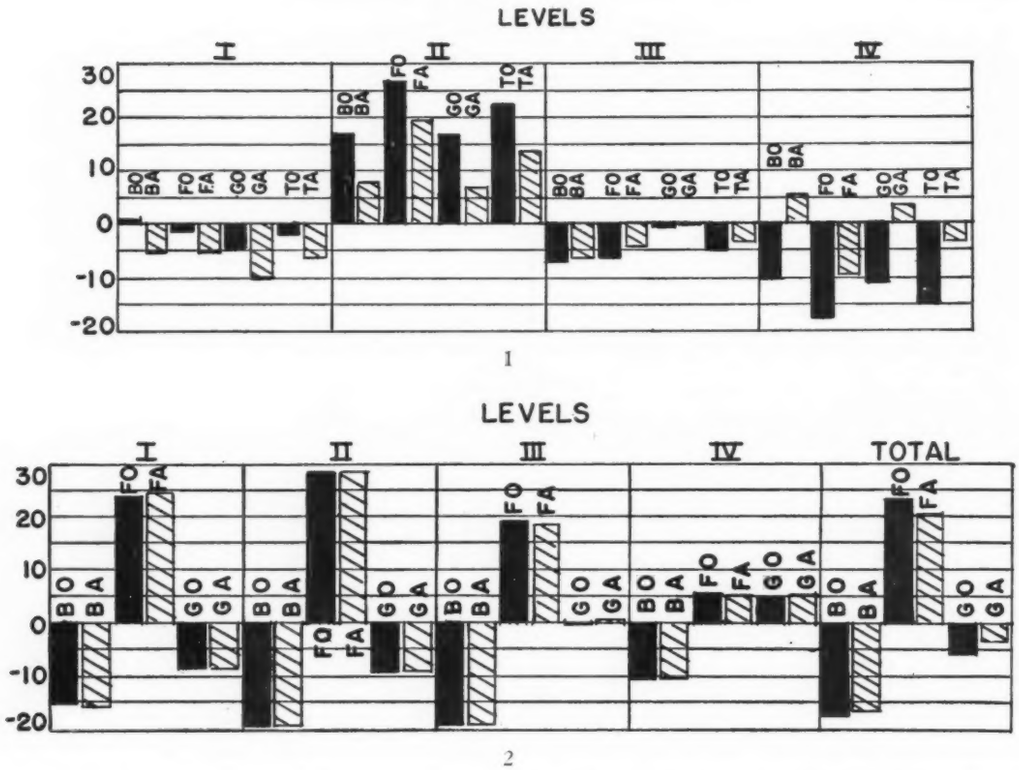


FIG. 37. Selected animal bones: 1 by Levels, 2 within Levels, Kawumkan Springs Midden.

game but in the same periods the increase in the use of birds for food is distinctly greater than that for game.

The relative importance of fish, birds, and game animals taken as the possible food animals may be ascertained by isolating out this series and treating them in the same manner as the series of five types. Table 11 gives the actual and derived data and figure 37 presents the material graphically.

First consider each of these three as a total, 100 per cent, and follow it through the four Levels as shown in figure 37-1. Fish show the lowest percentage of use in Level IV with an increase in III, a dominant position

TABLE 11

FOOD ANIMALS. NUMBER AND PERCENTAGES OF EACH TYPE BY LEVELS, ORIGINAL AND ADJUSTED AND DEVIATION OF EACH LEVEL FROM AVERAGE PERCENTAGE

	I		II		III		IV		Total		I	II	III	IV
	No.	%	No.	%	No.	%	No.	%	No.	%	+, −	+, −	+, −	+, −
Birds	109	26.0	175	41.7	75	17.9	60	14.4	419	100.0	+ 1.0	+16.7	−7.1	−10.6
Adjusted	104	19.2	175	32.4	98	18.2	163	30.2	540	100.0	− 5.8	+ 7.4	−6.8	+ 5.2
Fish	345	23.1	768	51.4	278	18.6	102	6.9	1,493	100.0	− 1.9	+26.4	−6.4	−18.1
Adjusted	339	19.5	768	44.2	359	20.7	271	15.6	1,737	100.0	− 5.5	+19.2	−4.3	− 9.4
Game	148	20.2	303	41.7	176	24.3	100	13.8	727	100.0	− 4.8	+16.7	−0.7	−11.2
Adjusted	143	14.9	303	15.7	238	32.8	272	37.1	956	100.0	−10.1	+ 6.7	−0.1	+ 3.5
Total	602	22.8	1,246	47.3	529	20.0	262	9.9	2,639	100.0	− 2.2	+22.3	−5.0	−15.1
Adjusted	586	18.2	1,246	38.5	695	21.5	706	21.8	3,233	100	− 6.8	+13.5	−3.5	− 3.2

TABLE 12

BONES OF FOOD ANIMALS. NUMBERS AND PERCENTAGES WITHIN EACH LEVEL, ORIGINAL AND ADJUSTED AND DEVIATIONS OF EACH FROM AVERAGE PERCENTAGE

	I		II		III		IV		Total		I	II	III	IV	Total
	No.	%	No.	%	No.	%	No.	%	No.	%	+, −	+, −	+, −	+, −	+, −
Birds	109	18.2	175	14.1	75	14.2	60	22.9	419	15.9	−15.1	−19.2	−19.1	−10.4	−17.4
Adjusted	104	17.8	175	14.1	98	14.1	163	23.1	540	16.7	−15.5	−19.2	−19.2	−10.2	−16.6
Fish	345	57.2	768	61.6	278	52.5	102	39.0	1,493	56.6	+23.9	+28.3	+19.2	+ 5.7	+23.3
Adjusted	339	57.8	768	61.6	359	51.7	271	38.4	1,737	53.7	+24.5	+28.3	+18.4	+ 5.1	+20.4
Game	148	24.6	303	24.3	176	33.3	100	38.1	727	27.5	− 8.7	− 9.0	0.0	+ 4.8	− 5.8
Adjusted	143	24.4	303	24.3	238	34.2	272	38.5	956	29.6	− 8.9	− 9.0	+ 0.9	+ 5.2	− 3.7
Total	602	100.0	1,246	100.0	529	100.0	262	100.0	2,639	100.0					
Adjusted	586	100.0	1,246	100.0	695	100.0	706	100.0	3,233	100.0					

in II and a drop in I. The adjusted figures change the detailed picture but not the general one. Birds, original figures, are low in Level IV, somewhat higher in III, highest in II and second highest in I. The adjusted figures show a preference for birds in Level IV but thereafter the trend corresponds to that for the original except that in Level II it drops as it does in I. However, it still shows a picture corresponding to that discussed for the series of five animals in the increase and decline in preference for the later periods of the midden.

Game animals are in an intermediate position in Level IV (original), show a rather marked increase in III with a marked prominence in II but the increase is less than that for birds, and a decrease occurs in I to a point below that of IV. The adjusted figures place game in Level IV in the positive series but not as strongly as birds. In Level III the percentage is slightly below the average but above that for birds, while in Level II it is below that for birds and in I markedly below.

Table 12 presents birds, fish and game within Levels and figure 37-2 shows the deviations from the average graphically. This organization of the data shows the importance of fish in these three categories in each Level with an increasing emphasis from IV to II and a slight drop in Level I.

Summarizing the direct evidence it is clear that there was a distinct change in the food habits of the midden occupants with the new patterns becoming stabilized in Level II. The evidence is not so strong that carnivores were food animals but it is possible to infer from the evidence that in the early stages of the midden occupation such was the case with the abandonment of the habit in the later periods. However, the evidence seems clear that rodents were eaten. Fish came to be the dominant article in the food economy in Level II and continued to the abandonment of the midden. Game was never very important in the overall picture and was least so in Level I. Birds came to be second to fish in Level II and continued so in I. What the relative importance of the mussel was cannot be stated in any precise form but it was certainly an article of very great significance. The final picture of the animal food economy of the midden corresponds closely to that given by Spier for the Klamath as described earlier in this monograph.

THE INDIRECT EVIDENCE

SCRAPERS

Approximately one-third of all artifacts are small scrapers, mostly made from flakes averaging about the size of one's thumb nail. Each one shows some retouching. There were only six well-defined knives found in the entire excavation. The small scrapers would serve very well to cut up the food animals for which we have direct evidence. The lack of large knives corresponds well with the absence of game. The scrapers support the direct evidence for the food habits. Tables 3 and 4, both for five and four Levels, show the distribution of the scrapers by Levels. While these figures do not correlate exactly with those for the food animals there is a close approximation. It is curious that Level II is slightly below Level I in the incidence of scrapers. It is of interest, however, that of the knives one comes from III, three from II, and two from I.

MANO-METATE

This set of grinding tools may be taken as indicative of the use of seeds for food. There were 343 mano-metate (adjusted) pieces (table 6). These occur at all Levels with the lowest percentage in Level IV and the highest in III. Whatever the significance of the vari-

ation in incidence it shows that seeds were used for food throughout the occupation of the midden. The use is emphasized in Level III and drops off in Levels II and I but remains markedly higher than in IV.

Two kinds of manos are found. One is the usual type for the area, a fine grained stone which has been more or less shaped initially, and then by use it reaches the finished flattened form. The other is a more specifically shaped instrument, usually made from some softer, coarser material such as consolidated pumice, which lends itself to shaping more readily than the other material. Since it is lighter it also permits manipulation more readily by the user. It is possible that this second type was used for fine grinding of seeds and was developmentally ancestral to the complex of tools later used for *Wocas* preparation. The possible relationship is shown in chart 2, p. 421.

MORTAR-PESTLE

This household utensil could have been used for grinding seeds, crushing and macerating roots, pounding up dried fish, and possibly other purposes. The grinding of roots and seeds, to a lesser extent, can probably justifiably be taken as the main use of these utensils. There were 228 (adjusted) of these. They occur throughout all Levels. *Cf.* fig. 11. It is interesting that their incidence follows almost exactly that of the mano-metate. Roots must have followed closely the use of seeds as food objects.

CHOPPERS

These tools must have been used for cutting roots, wood, occasionally game animals, and larger animals such as salmon. Their main function probably was for use with root gathering and preparation. Table 6 and figure 16 show that the distribution of the adjusted total of 227 is lowest in Level IV, highest in III, next in II, and next in I. After Level III there is a decline but not to the point of Level IV. The correspondence with the mano-metate is close in the two lowest Levels but breaks down in Level I.

There are no other sources of indirect evidence from which any inferences may be made that will add to the picture we have already drawn.

SUMMARY OF FOOD HABITS

The evidence, both direct and indirect, shows that the food habits of the occupants were organized around the use of small animals in the early stages of the midden occupation with supporting foods derived from seeds and roots. Fish became the main article of diet during Level II and continues into I. Rodents which were important during Levels IV and III drop in Levels II and I. Birds increase in use in Levels II and I over the earlier pattern. Game animals were never a really important element in the food pattern. Mussels were very important but to what exact extent cannot be asserted with any confidence. A well-established pattern of the use of seeds and roots existed throughout the occupancy of the midden but with some variation in incidence with the lowest in the earliest period, Level IV. By Level II the food patterns characteristic of the Klamath were being established and had become stabilized during Level I. However, the kinds of seeds and roots eaten by the occupants of the midden can only be inferred from information on the Klamath and the ecological potentials. One thing we do know is that the particular series of utensils for exploitation of *Wocas* had not been developed by the occupants of the midden; but this does not mean that they did not use *Wocas* as an article of food.

THE ECOLOGICAL ADAPTATION

At the time of the earliest occupation of the Klamath Lake Basin, as we have pointed out earlier in this paper, there was probably little difference between the vegetation cover and the faunal life of this area and the Great Basin except the riverine resources of fish. Waterfowl bones have been found in the early Northern Great Basin sites (Cressman, 1942: 93, appendix H) as food objects. Elk also were killed (Cressman, 1942: 63) but are not found in the region now or in the Klamath area. Fish adequate for food were lacking in the pluvial lakes of the Northern Great Basin. While the Great Basin ecology went through a series of profound changes during the Neothermal there is no evidence that the Upper Klamath Lake region went through any changes comparable to that of the Great Basin. The problem of adaptation to the Klamath ecology, therefore, is one of the development of the food resources of a stable area.

The evidence from the food animals shows that in the earliest Level there was an approximation to the food habits for the contemporary population of the Northern Great Basin except for the use of fish. There was the use of a wide variety of food animals as well as the exploitation of the roots and seeds. Slowly but increasingly the midden population concentrated its dietary interests on the river and marsh economy until in Level II the basic food economy of the Klamath Lake area was established, a heavy use of fish and birds, little use of game and rodents, exploitation of seed and root resources, and for the midden period the use of mussels throughout its history.

While the picture is clear for the gradual adaptation to the exploitation of the riverine and marsh economy it is not so clear what the dynamics of the process were. Excavation on the south bank of the Columbia River at Five Mile Rapids in 1954 (unpublished material) has shown occupation of that area at the close of the Pleistocene as far as we can determine from the best geological evidence available. From the very beginning of the

occupation of that site there was a heavy use of the fish resources of the Columbia River. Furthermore, the projectile point type, the only one found there in the early period, is closely similar to the Type 11 so important at Kawumkan Springs. There seems to be little doubt that the earliest occupations of the two areas are fairly synchronous. The Type 11 point of Kawumkan Springs is not a Great Basin type. The new evidence from the Columbia River strongly suggests that perhaps migrants from that area into the Klamath Lake country may have introduced the pattern of the exploitation of the river resources and at the same time brought with them the kind of point characteristic of the midden but generally alien to the Great Basin. The solution of the problem of the dynamics of the process of adaptation has been complicated by the discoveries on the Columbia River but the fact of the adaptation is clear.

IX. DOG BURIALS

Portions of five dog skeletons were excavated in the Kawumkan Springs Midden, one from a superimposed house pit, two from Medicine Rock Cave, and one from the Williamson River house pits. The mandible of a wolf was found close to burial 11-222 and may have been associated with it. The skeleton of a coyote was excavated from a house pit, Gentry-I, on the Williamson River. This skeletal material was kindly studied by Dr. William C. Haag who has prepared a report which appears as Appendix B.

It is possible that we do not have intentional burials of these dogs, that is in any ritual sense. However, they were entombed in the various sites and for that reason are listed as "burials." It is not intended by the use of the word "burial" to indicate any kind of ceremonial inhumation although in some cases it is quite possible that such occurred. Figure 55-1, 2 shows two skeletons *in situ*. The specimen in 2 has the broken femur which Dr. Haag refers to. The projectile point is below the level of the skeleton and not associated.

KAWUMKAN SPRINGS

Figure 6 shows the distribution of the dog burials. It will be noticed that there is a correspondence between the areas in which the human and dog remains are found except that human occur exclusively in the pit at 28–30X and 8–10Y and in the 31–34X/0–2Y section. All specimens were buried in previously built-up midden and occupation continued over the graves.

Dr. Haag finds three types of dogs in our series and all are represented at Kawumkan. The types are, in order of size, the Kodiak Island small dog, the Northwest Coast Shell Heap variety, and the large Siberian type. Dr. Haag points out that these dogs have been assumed to appear chronologically with the smallest being earliest and the largest the most recent. While the evidence from Kawumkan Springs does not unquestionably support this theory, it is in close agreement with it. The Kodiak Island small dog is found in Level IV but occurs in Level III with a Northwest Coast Shell Heap specimen 10 cm. below it. There is 1.5 m. horizontal distance between the location of the two specimens. In figure 2, the profile along 24X shows a depression between 12 and 14Y, the space in which the Northwest type was found. It is possible that in some way this unevenness of the ground might have had some effect on the burial here that would interfere with the ordinary time relationship to the Kodiak Island dogs found further along the trench but at a point above the level of the depression. If the midden were in use as a total area, it is difficult to see how such a depression would affect the deposition, at least on the assumption that the surface was reasonably smooth. Of course it might not have been.

A more plausible explanation would seem to be that there could be an overlap of types rather than discontinuous series in time. There is no evidence of abandonment of the midden and reoccupation although there seems to be evidence of infiltration of new population elements in Level III, probably late, time as pointed out in the Summary to Chapter V. It would be desirable, too, to have a much larger series of skeletons so that the materials could be handled as populations.

The large Siberian type occurs in Level I and on the earlier of the two floor levels of the Long-II house pit. It is of particular interest that the Kawumkan Springs Midden contains the remains of the three different types of dogs and that in general their appearance is correlated with changes in chronology.

MEDICINE ROCK CAVE

It is impossible to separate the two specimens, a Northwest Coast Shell Heap type and a Siberian, stratigraphically from this site. Both are from above the pumice. The lack of artifacts and the compactness of the deposit, mostly charcoal mixed with sand and dust, make any estimate of time lapse for the deposit a hazardous guess. (We have made such on p. 402.) At any rate, the pumice deposit is correlated with the eruption of Mount Mazama and has a date, C-14, of approximately 6,500 years ago. So both these specimens should be more recent than that date, although it is unfortunate that we cannot give elevations on them to indicate the relative order of appearance.

THE GENTRY HOUSE PIT

A portion of a pelvis and a vertebra were found here but these do not permit use for comparison.

CHRONOLOGY

Some suggestions of chronology for the appearance of these types of dogs in this area as represented by our series should be given, but the chronology of the occu-

pation of the area will be fully discussed later. All dates have to be relative. Two radiocarbon dates for the region and a dendrochronology date from the southwest can be used as reference points, but for the most part cultural cross dating has to be used.

The human skeleton, 11-222, showed that this adult male was killed by a long bevelled bone projectile point in the lower left abdominal region and a large obsidian side-notched point that had probably entered through his right eye and lodged in the left rear occipital region with the point almost against the bone. This type of bone projectile point has been reported from Lower Klamath Lake by Cressman (1942, 1951) and from Clovis, New Mexico (Cotter, 1937), and from Florida (Jenks, 1941). While it does not follow that the time range is the same in each case, yet this type of point has been associated with an extinct fauna, the same kinds of animals having been found at Clovis and Lower Klamath Lake. Cressman pointed out that these points at Lower Klamath Lake were associated with the Early Period which terminated 7,500 to 7,000 years ago with the onset of the Altithermal. The point found in the skull is very like some of those from the Early Period at Lower Klamath Lake (Cressman, 1942: fig. 98*a*). The argument for the minimum date for the end of the Early Period at Lower Klamath Lake was based on the evidence for the desiccation of the lake consisting of the concentration of faunal remains and artifacts around certain low points in the old lake bed; in other words, the story of the drying up of a water hole.

At the time the Great Basin lakes were drying up, Kawumkan Springs was like an oasis with its fish, the shell fish in the adjacent river, and in all likelihood the waterfowl that congregated there as well as the game which would gradually drift into the area. It is certainly reasonable that hunters who were being pushed from their home areas by the loss of their water supply and the consequent result on the food animals would try to establish themselves in other more favorable areas. Kawumkan Springs was the most desirable place in the whole vast area. If the site were already occupied then, one could expect that it would probably be fought over. I shall discuss this point later in connection with the human remains.

On the basis of the bone projectile point, cross dating may be used with the Early Horizon of the Lower Klamath Lake sites. While the stone projectile point cannot be used alone, it can be used as supplementary evidence. This type of point occurs in the Kawumkan Springs Midden but none is as well made as the lethal specimen. Points of this kind at Lower Klamath Lake are well made as they are in the other Northern Great Basin sites. It is quite probable that some of the points of this type found at Kawumkan Springs were not made there but represent specimens used in fighting by groups pressing into the area from the less favorable surrounding country.

This burial rests in the top of Level IV but it probably should be assigned to the early part of Level III if we assume that even a shallow grave was dug. The stones had been removed from the "kitchen" to form the grave and it is likely that the "kitchen" had been abandoned and covered by midden before this site had been chosen for the burial.

With these data in mind then a terminal date for Level IV is suggested at 7,500 years ago. Level III extends to 3,500, Level II from 3,500 to 2,500 and Level I from 2,500 years ago to A.D. 250. The eruption of Mount Mazama is given at 6,500 (Arnold and Libby, 1950) and would fall into the Level III period. The further data on which the chronology is based will be discussed in the section on chronology.

Using these dates we may apply them to the dates of the appearance of the dogs at Kawumkan and Medicine Rock Cave. The Kodiak Island small dog in Level IV would date from 7,500 or earlier. It continues into Level III to some point between 7,500 and 3,500 years ago. In this same period the Northwest Coast Shell Heap type first appears and from the stratigraphic evidence is contemporary with the earlier type in that dog's later history. The Northwest Coast type of dog is found after 6,500 years ago but how long is not known. After this date the Siberian dog also appears in Medicine Rock Cave and in Level I at Kawumkan, and in the Long-II house pit on the earlier floor. (There were two floor levels separated by midden fill at this pit.) It is not clear what the relation of the Kodiak Island large dog is to the Siberian type, but a recent report (Haag and Heizer, 1953) describes the former type from a horizon in the Sacramento Valley with a radiocarbon date of 4,052 years. This would seem to be in line with the dates suggested above. These dates, however, are much greater than those previously estimated for the appearance of the dog in the New World but it is only since 1950 that there has been any kind of absolute chronology which could be used as a frame of reference. The suggested chronology from the Klamath area does not seem to be out of line with the present information on the time of occupation of the New World.

SUMMARY

The dog skeletons from the sites in this area show three types of animals, the smallest being the Kodiak Island small dog, the next is the variety named the Northwest Coast Shell Heap type, and the last is the latest and largest, the Siberian variety. While the developmental history of these dogs is not clear, the present point of view is that the smallest dog appears first in aboriginal history, followed in succession by the other two in the order of size. The appearance of the Northwest Coast type at Kawumkan Springs, if we accept the stratigraphic record, occurs before the disappearance of the Kodiak Island small dog. It must be admitted

that this relationship is not as clear as we would like to have it, but at any rate the overlap is nominal. It is the kind of thing to be expected if population movements associated with a different breed of dog were taking place in the area. On the other hand, if the relationship between these two varieties of dogs is a genetic one, then the overlap would also be expectable with the larger dog eventually crowding out the smaller breed. The appearance of the Northwest Coast type with Level III lends support to either of the hypotheses.

X. HUMAN SKELETAL REMAINS

The analysis of the measurable skeletal remains is given in Appendix C. I am indebted to my colleague, Dr. W. S. Laughlin, for this study. This discussion will be limited to the nature of the remains and the general conditions in which they were found. During the excavation of the midden in 1949 portions of eighteen skeletons were found. Table 13 gives data on their location, orientation, etc.

During the 1948 excavations while a trench was being cut between house pits Long-IV and III a burial was accidentally discovered but the cranium was completely demolished by the mattock. The rest of the skeleton was exposed, photographed, and reburied. In the north wall of the same trench approximately 1 m. from the burial an isolated calvarium was uncovered. Neither of these remains was accompanied by grave goods. The burial, probably that of an adult male, was in a fully flexed position, lying on its left side, head toward the southwest and facing northwest. We determined in 1949 that the calvarium belonged to the confused series of parts found between 29.0–30.5X and 8.0–10.5Y. Also in 1948 a mandible was found either on the floor of Long-IV or slightly under it. We cannot be absolutely certain because of the extreme difficulty in isolating the floors of the midden house pits.

THE MIDDEN REMAINS, 1949

The remains excavated in 1949 may be grouped into three categories for discussion: (1) burials, (2) secondary or disturbed specimens, and (3) parts of skeletons whose method of deposition is uncertain. For locations see figure 6.

BURIALS

There were four definite burials and the orientation of these could be determined. Table 13 gives the detailed information. Only one of these gives any evidence of grave goods, No. 11-222. Three small pestle-like objects (fig. 57-5), which might be atlatl weights, were some distance in front of the body. They seem to be almost too far away to be associated. Just above and in front of the frontal region were the two halves of a large wolf mandible. Had these been on some kind of a cord for suspension their distance from the body

TABLE 13

HUMAN SKELETAL REMAINS

Number	Location		Levels				Position	Orientation	Description *cf.* figs. 56–58
	X	Y	I	II	III	IV			
11–220	33.0–33.5	0.10–0.7			x		F.L.	N–F.E.	On sandstone, crushed.
11–221	31.4	1.88			x		F.R.	S–F.E.	Portions of skull and long bones.
11–222	33.85	2.0			x	x	F.R.	S–F.E.	Cranium, long bones, face crushed.
11–223	32–34	1.45–1.50			x		?	?	Nuchal portion, temporal portion.
11–224	32.95	1.9				x	?	?	Portion of adolescent cranium.
11–225	32.95	1.9				x	?	?	Portion of adolescent cranium.
11–226	29.2–30	8.4–9.5		x	x		?	?	Disturbed or secondary.
11–227	29.2–30	8.4–9.5		x			?	?	Disturbed or secondary.
11–228	22.5	1.7		x			?	?	Occipital only—adol.?
11–229	17.8	1.3		x			?	?	Upper left temporal portion.
11–230	19.8	1.4		x			?	?	Left temp. squama.
11–231	20–22	0–1		x					Right temp. squama—adol.?
11–232	29.0	8.25		x	x				Portions of long bones, Cf. 226, 227.
11–233	28.6	21.6			x				Frag. left femur.
11–234	23.5	3.05			x				2 femora (under kitchen).
11–235	23.37	19.1–19.9				x			Portion of skull and long bones, skull extends into III.
11–236	23.8	25.0			x (deep)		F.R.	W–F.S.	Complete.
11–237	23–24	10–12			x				Small frag. of cranium used for test of mineralizing material.

F—Flexed.
R—Right side.
L—Left side.
N—Head north.
F.E.—Facing east.

could well be explained. The two fleshers found close by are woman's tools and can hardly be assigned to the burial. The same must be said for the large combination two-handled mano and pestle. It is possible that all these artifacts and the mandible are debris of the "kitchen" into which he was buried. If the three objects were atlatl weights instead of small pestles and were on atlatls which were placed carelessly with the body their position could be accounted for.

This person had been killed by a long bone projectile point in the lower left abdominal region and a side notched atlatl point in the left occipital region. The latter apparently entered through the right eye or approximately there but not through the brain case.

No. 11-220 was found in the exploratory trench where the underlying sandstone dropped off rather abruptly. The fill here was very wet. The bones could not be removed except in fragments although they were uncovered sufficiently to determine that it was a burial and to reveal pertinent information about it. Figure 56-1.

No. 11-221, fig. 56-2, was fragmentary and while the skull was crushed there were enough of the long bones to determine the position and orientation. It was possible to reconstruct much of the brain case and the supraorbital portion.

No. 11-236, fig. 58-1, 2, is almost complete and is the skeleton of a female. The skull, deep in the trench and projecting from the wall, was struck by a shovel near the end of the day as we were hurrying to clean up that end of the trench to close out our season's work the next morning. With a trowel we soon exposed the skull and it was clear that the rest of the skeleton extended into the unexcavated adjacent area. Fortunately, there was a band of crushed shells extending into that area over the burial from the trench so the stratigraphic position of the burial was clear. Therefore, in view of the pressure of time we used somewhat unorthodox methods of excavation. We determined that the overlying midden was sufficiently hard to permit undercutting and then removed enough of the overlying fill to permit us to expose the skeleton properly. When this was done we had the skull in bright sunlight and the rest in deep shadow. To photograph the burial we used flash.

SECONDARY OR DISTURBED BURIALS

Nos. 11-226 and 227, fig. 5, are difficult to account for. Probably disturbed is a better word than secondary for these remains. Figure 5 shows how the bones were scattered both horizontally and vertically. Furthermore, they are mixed with animal bones and household articles. It is possible that the later occupants of the midden in digging a close-by house pit might have dug the bones out and thrown them aside. That hardly seems possible because they are not under any debris thrown out from a pit. Further the stratigraphic position of the bones does not permit such an interpretation unless there had been some kind of an unexplained hole in the midden which later filled up. This seems hardly plausible. The house pits are much too late to correlate them in time with the bottom of Level II and the top of Level III. There is no order to the position in which the bones lay. If they were near the surface in Level I the house pit origin would be a more tenable theory. Since the midden was building up and was not being dug into until after its abandonment as a midden I find it difficult to formulate any explanation based on digging into a burial by the occupants and the subsequent reburial or deposit of the bones on some supposed dump area. I simply have no convincing theory to account for them in the situation in which they were found.

UNCERTAIN METHODS OF DEPOSITION

Table 13 indicates twelve specimens, mostly fragments, found at varying depths and horizontal locations. Again explanation of the origins of these fragments is impossible. Certain of these pieces were found in the "kitchens," others under a "kitchen," others at random locations. Figure 56-4 shows a femur lying on the sandstone. Portions of skulls are most numerous in the series. Nos. 11-224 and 225 are included in this class. There were more parts of these skeletons but for certain very practical reasons at the time we could not excavate them. It was impossible to determine whether they represented former burials. Both were adolescents. The skull of one rested on top of the other and the mandible of the top cranium was in position on the frontal bone of the other with the calvarium separated and fallen backwards over the occipital part of the under cranium (fig. 57-2). Both crania were still in contact with each other. Each one appeared to have been killed by a blow with a blunt instrument at the base of the skull which in each case showed an inward protruding fracture and radiating cracks. There was no evidence of flexion. A long bone of an arm was in a position to the right of the crania and somewhat above as though the bodies had been on their backs. One gets the impression of the two individuals having been killed and thrown one on top of the other and on their backs with the arm of probably the upper one thrown out to the right. These two were about 40 cm. below the "kitchen" into which no. 11-222 had been buried.

Here too, I am at a loss for a satisfactory explanation of the origins of these scattered fragments. Small portions could be moved about by rodents but one would not expect small animals to move a portion of a skull very far, and yet we did not find bodies with any of the missing parts gone in the vicinity of any single piece. Dogs could dig up and carry away a femur and this must be considered a possibility, and the record shows dogs through much of the midden's use. While this explanation is a possible one it is hardly probable, if we assume, as we must in view of the evidence, that the site was in continuous use.

It has been suggested that the portions of crania from the "kitchens" indicate cannibalism in the form of eating brains of victims. While this is possible there is nothing to prove it. The bones show no signs of fire or cooking; they look like all the other specimens, but if the brains were removed for eating the bones would not be affected. However, one would rightly expect to find other portions of the skull than what we did. The evidence for cannibalism is unconvincing to me.

DISTRIBUTION OF HUMAN BONES

Figure 6 shows the distribution of all burials and human bones both horizontally and by actual elevation from our arbitrary datum of 100 m. It is clear that the only portion of the excavation in which none were found is the first eighteen meters of the exploratory trench and from 0-2Y. They are scattered throughout the rest of the area with the exception of the two stratipits on the north side of the 22-24X trench. While there seem to be certain places of clusters these can hardly be called cemetery plots in view of the distribution of the other remains. Burial or deposition took place in the midden, perhaps in a lightly used part, and the midden continued to accumulate over the dead as life went on. None of the areas in which burials occur show any sterile deposits. I stated the assumption, and the evidence on which it was based, that the midden was occupied for all practical purposes over its entire surface at the same time. This could be true and yet permit some area to be less in use than others. This is a possibility that must be recognized and there is no way of absolutely proving or disproving it. The result is that we have to infer that burials took place in the living areas.

The vertical distribution of the bones shows that most come from Levels III and II with four from IV and none from I. No. 11-222 is partly in Level IV but the time of burial is probably that of the early part of Level III. Since a brief statement of chronology has been given previously in the discussion of Dog Burials and a more complete one will be given later there is no point in repeating here what has already been said, especially since in that discussion I used some of the burial evidence to support my theories.

PATTERNS OF BURIAL

The four burials are all fully flexed. One was on the left side and three on the right. Two had their heads toward the north, one toward the south, and one toward the west. Three faced east and one south, the latter being the one whose head was toward the west. Full flexion and burial on the side seems to be the only common practice. Three lie on their right sides and three face the east.

CONDITION OF THE BONES

All the bones are heavily mineralized. It is surprising that so many bones are well preserved from an open site where there is a reasonable amount of precipitation. Probably the preserving agency was the heavy amount of calcium carbonate in the fill provided by the leaching of the mussel shells as they were tramped up by the occupants of the midden. I have called attention to the heavy use of mussels for food. Tests on the bones show that the mineralizing agent was calcium carbonate. Once the bones were cleaned and those from the wet area dried they could be worked over very easily for they are very hard.

No. 11-221 strongly suggests a violent end. The skull is broken in the right temporal region with a piece missing. There is a break at the occipital end of the sagittal suture with the portion missing. The fracture pattern of the skull strongly suggests violent blows.

The condition of the adolescent crania in this connection has already been discussed. The individual represented by No. 11-222 died violently but by projectiles.

SUMMARY

Four well-defined burials among the remains of eighteen individuals were excavated. They were well distributed throughout the midden and from Level IV through Level II. The bones are well fossilized. Explanation of the origin of the scattered fragmentary remains is at present impossible. The burials were fully flexed and buried on the side but neither consistently on the same side nor oriented in the same direction and consequently they faced in different directions. Sudden and violent death seems to have been common.

XI. THE CHRONOLOGY OF THE CULTURAL DEVELOPMENT OF THE KLAMATH AREA

Some discussion of chronology has been given previously, specifically at the end of the section dealing with projectile points and again in the chapter on the dog skeletons. This chapter will attempt to give a coherent chronology for the development of the culture of the Klamath Lake Basin.

The chronology of any given area must be seen as a part of the greater area of which it is a part or to which it is related. Since the chronology which will be suggested here is related to that for the Great Basin, it is desirable to present a brief statement of that for the wider area. Antevs, in a series of papers over a considerable number of years, has formulated a geochronological system for the Great Basin which is generally accepted although there may be a difference of opinion in the matter of details. He suggested (Antevs, 1948: 19) the same Neothermal for the Postglacial or Postpluvial.

He subdivided the Neothermal into three subdivisions corresponding to the earlier Early, Middle, and Late Postpluvial and called them the Anathermal, Altithermal, and the Medithermal respectively. His final estimate of the dates (1953: chart 1) for these three pe-

riods puts the beginning of the Anathermal (rising temperature, decreasing precipitation) at just before 10,000 years ago; the Altithermal (abnormally high temperature and drought conditions) begins at 7,000 years ago and extends to about 4,500 years as far as temperature is concerned, and to 4,000 in terms of moisture. Following this comes the Medithermal or period of intermediate temperature and rainfall extending to the present. Since the terminology is based on temperature conditions as being less regionally affected than rainfall, and therefore a more reliable indicator of climatic conditions, the appropriate date for the beginning of the Medithermal should be 4,500 years ago. However, what we usually see as the indicator of change is the effect of the change in rainfall as it shows up in beaches around the lakes. A sound statement to use is that of Antevs (1953: 26) in which he says, "That is, the dry age ended about 4,000 years ago." This is the geochronological frame of reference we shall use.

In the early part of this paper in the section dealing with The Problem the evidence was presented for the antiquity of occupation of the areas on the north, east, and south of the Klamath Lake area. It may be to our advantage to restate it briefly here. To the north on the Deschutes River artifacts come from well below the Mount Mazama (Crater Lake) pumice giving a date well before 6,500 years ago. At the east end of Odell Lake, some thirty miles further south near the summit of the Cascade Range, an occupation site extends some eighteen inches deep into the glacial till underlying the Mount Mazama pumice. At Fort Rock, northeast of the Klamath Lake Basin, sandals have a date of just over 9,000 years ago. In the Summer Lake caves five miles out from Paisley occupation occurs under Mount Mazama pumice and considerably earlier where it is associated in the latter case with the bones of *Equus*, camel, bison, and other animals. Some sixty miles south of Klamath Lake, in the bed of Lower Klamath Lake, artifacts are associated with the bones of *Equus*, camel, and probably mammoth. Our work in The Dalles dam reservoir on the Columbia River during 1953–1954 has indicated human occupation of that area at the end of the Pleistocene, an estimate made on the best geological evidence so far available (unpublished information). Daugherty has reported a site in southeastern Washington dated at over 9,000 years (paper read before American Anthropological Association, Tucson, Christmas meetings, 1953), while Cressman and Laughlin (1941), and Cressman (1947), have published on a probable early association of man with mammoth in the Willamette Valley. Thus, on all sides except the rugged area of the Cascade Range to the immediate west there is evidence of human occupation of a considerable antiquity. It is in this frame of reference then that the Klamath Lake materials must be placed. The data which we shall use comes from the various village sites with house pits, the Kawumkan Springs Midden, and Medicine Rock Cave. Fortunately these sources are all in a restricted area and overlap sufficiently to permit the reconstruction of an estimated chronological column or cultural continuum.

RELATIVE DATES

REFERENCE TO GEOLOGICAL FEATURES OF KNOWN AGE

The only source of this kind for our region that we have available is the Mount Mazama pumice in Medicine Rock Cave. The constancy of the environment in the Klamath Lake area, which provides the setting for the problem at the same time, removes the geological and climatic markers which are so useful in the Great Basin region as time referents. The small amount of pumice and ash found under the midden deposits in scattered spots cannot be used, for there is evidence that it represents redeposition on an old Pliocene surface. Medicine Rock Cave was occupied spasmodically sometime before 6,500 years ago, but how long before it is impossible to say. One well-made projectile point comes from just below the pumice although not in contact with it, and a fire lens occurs well below the pumice. On the strength of this evidence it may be stated that the occupation of the Klamath Lake area fits into the wider frame of reference given above.

CROSS DATING WITH CULTURAL MANIFESTATIONS

Cross dating of cultural manifestations is a tricky business unless certain conditions are fulfilled. These are: (1) the existence of a good diagnostic cultural trait with a wide distribution and a short time span, (2) correctness of the age of the referent cultural manifestation, (3) proof of the antecedence of the referent manifestation, (4) knowledge of the direction of diffusion or the point from which the diffusion has taken place, (5) proof that the different manifestations represent parts of a single development and are not the product of independent invention.

1. *The existence of a good diagnostic trait.* In a hunting and gathering culture, unless there are clear-cut adaptations to quite different ecological opportunities, there are likely to be many similarities that cannot be used reliably to trace relationships, for they express adaptation to the similar demands of the environment and the way of life. Many of these traits have a long history even when widely distributed and thus lose their utility for cross dating. One is, therefore, faced with the problem of the choice of significant comparative materials. On a larger scale one may use the wider patterns of adaptation such as hunting as opposed to hunting and gathering. On a more restricted plane more limited patterns of technological development, which are unlikely to represent independent invention because of their complexity and occurrence in a restricated area, are useful. Finally, a single trait or a complex which is diagnostic in a certain area may be

used if it occurs elsewhere. In the latter case are the two-horned manos or mullers of the Klamath-Modoc, and the bevelled bone point found at Clovis and at Lower Klamath Lake and in each case with the same faunal association.

2. *The correctness of the estimated age of the referent cultural manifestation.* The accuracy of a comparison by which an age is given will be in part a function of the correctness of the age of the referent. Even if an exact age can be given to the referent, the age of the manifestation under consideration may be earlier, later, or the same age as the referent. The solution to this difficulty will depend on two other types of information. They are points 3 and 4 above and are discussed immediately following.

3. *Evidence of antecedence of a manifestation.* In order to determine the relative age it is necessary to know the order of manifestations in time which are being compared. If B, C, D are being cross dated with A, then it is necessary to know whether A is really earlier than the others or where in the series it falls. In the construction of a cultural sequence it is not enough to say that all are of the same age; we have to have the sequential aspects. There is another aspect of this problem that can be illustrated by the Clovis and Klamath Lake traits mentioned above. A straight comparison involves the implicit assumption that one is derived from the other but it does not indicate the direction of diffusion. However, there is another consideration to keep in mind, namely, that both may be derived from a common source which is at present unknown. The location of this source in time and space would materially change the relationships of the two manifestations depending on the location in space and time of the parent source. This leads to the next problem, 4 above.

4. *The direction of diffusion.* If diffusion is involved then passage of time must be considered during which the compared manifestation spread from the point of origin to the place where it was found. In the absence of absolute dates and reliable geological time markers, the solution to this question is impossible beyond the terms of "the best guess." These three conditions, (1) correctness of the estimated age of the referent culture, (2) antecedence of the cultural manifestation, and (3) the direction of diffusion singly and together, impose limitations on the exactness of the method of cross dating of cultural remains.

5. *Certainty of evidence against independent invention.* This problem is, of course, basic in any historical reconstruction. If independent invention is recognized as the source of two similar manifestations, then there is no basis for cross dating for the two occurrences are unrelated. It does not seem improbable to me that many technological developments could have been quite independently made. Given a rough similarity of cultural development in comparable ecological areas and the limited ways by which certain problems may be met, it is not unlikely that the same solution would be arrived at quite independently. Aboriginal man also had brains and a lively sense of how to use them or he would not have survived. In a limited area where there was contact, the question of independent invention versus diffusion becomes less important than in the case of widely separated regions. For example, there is every reason to believe that there was contact to a greater or less degree between the Klamath Lake region and the surrounding areas of the Great Basin as well as the Columbia River. On the other hand, contact between the Klamath Lake region and the High Plains seems out of the question until very late times and then via the "middle men" both to the east and on the Columbia River, specially the latter. Cross dating within our frame of reference seems possible, for there is little reason to suspect any large number of independent inventions in this limited area, at least in the limited inventory of tools with which we have to work.

REFERENT CULTURAL MANIFESTATIONS

The Early Horizon of Lower Klamath Lake, sixty miles to the south, provides cross dating materials with the bevelled bone projectile point and the side notched point found in the skeleton, no. 11-222. This has been discussed in some detail on page 164 and following. Here we shall point out that the midden was started at some point antecedent to the affair which left these weapons at the midden. With a minimum date on the Early Horizon of 7,000 years ago, then, we would be justified in saying that the midden was begun certainly before that time, but how long we do not know. We shall come back to this a little later.

Another reference point is the Odell Lake site where points similar to the Type 11 of the midden were found in the glacial till to a depth of eighteen inches under Mount Mazama pumice. The date for this is 6,500 years ago. However, the Type 11 point occurs throughout the midden but with the Lower Klamath Lake reference we can relate the Odell Lake site to the earlier manifestations of the midden, probably about the same time as the Lower Klamath Lake contact referred to.

The appearance of the small "Shoshonean" type of points, our 4 and 5, provides another source of comparison but not as useful as the two already used and they appear much later. They are not as specifically defined in time and their method of introduction into our area is unknown. It is reasonable on the basis of present knowledge to assign an earlier time to their first appearance in the Northern Great Basin than in the Colorado Plateau unless we wish to assume a northward diffusion. There is absolutely no evidence to support such a theory, northward diffusion, and in view of the southward migration of the Shoshonean peoples it is reasonable to assume their earlier appearance in the

northern part of the Intermontane than in the south. Morris (1939: 19) writes:

> While I have no confirmation of the use of bow and arrow by people of Basket Maker II, one find in Canyon del Muerto leaves no doubt that they were in contact or, better, in conflict with an arrow-using tribe. . . . Obviously the bow was in use by whatever tribe the attacking party represented.

He states on page 5, "Presumably the transition from Basket Maker II to III came within this interval (150–475 A.D.)."

It is clear that small points may have existed along with larger ones since not all atlatls were of the same size, and that small points may also have been introduced with the bow and arrow and developed later in an area with the adoption of that weapon. These possibilities were pointed out earlier (Cressman, Williams, and Krieger, 1940). These inferences were based on the stratigraphic evidence from Oregon caves and atlatls of different size found there. Woodbury (1954: figs. 25, 26) illustrates series of small points from northeastern Arizona, but unfortunately they are mostly "Unassigned." One or two are assigned to Pueblo V but this does not give us information on the earliest appearance.

Jennings (1953) shows that relatively small points, his B13, B26, B27, are all found in Danger Cave relatively early. B13 first appears in II while the others appear first in III. This range of dates certainly makes it extremely difficult to use "size of point" as any kind of a horizon marker in a general sense as suggested by Krieger (Krieger, 1950). Such a use may eventually be developed for a restricted area when more of the history of that region is known.

While we cannot use these small points from the Kawumkan Springs Midden for cross dating in any satisfactory way, we can say with support from other areas that they appear fairly early in the Great Basin and that their use probably extends back well beyond 2,000 years ago. Our point Types 4 and 5 seem well established in the Southwest by Developmental Pueblo times and how long before that they first appeared in the North is problematical. Lovelock Cave, Nevada, reports arrows for Level III (Loud and Harrington, 1929: 25) but tells us nothing of the size of points. Libby (1954) has recently published C-14 dates for Level II and Level V of this cave. Level II is 1,686 ± 220 and Level V is 3,172 ± 260. These are average dates for the Levels and they bracket the period in which the arrows are first recorded with a date presumably closer to Level II than V. This would in all likelihood be not later than 2,000 years ago. By inference we may say that there were small points in use then but unfortunately we do not have the points.

One other instance of cross dating may be discussed, for it gives us a minimum date on the two-horned manos or mullers. Kidder (1932: 99, fig. 75) found at Pecos a two-horned mano with a cache of ceremonial objects. Jeancon (1923: pl. 59) in the Chama also found one with a cache of ceremonial goods and he called it a Koshare. Kidder thought his specimen looked like a grinding tool, but he was unfamiliar with the Klamath-Modoc instrument. He put it in the "Problematical" category. The writer identified these objects as the Klamath-Modoc instruments when working on the Great Basin in 1940. Since then attention has been called to them in print. Gifford (1949) wrote:

> Although not concerned with the subject of this note, yet nevertheless with the matter of cross-dating, is the horned muller pictured by A. V. Kidder in his *Artifacts of Pecos*. He attributes this to Pueblo IV, Glaze V period. This specimen appears to be the type of muller used by the Klamath Lake Indians of southern Oregon. This Pecos specimen therefore establishes a minimum date for the type in its homeland. J. A. Jeancon pictures another from the Chama Valley, New Mexico.

Cressman (1950) also called attention to this evidence of relationship. The date on this specimen at Pecos is about 1540. While we do not have the least idea of the method of diffusion of these specimens to the Rio Grande area, or how long it took, we can be sure that their function was unknown to the recipients, for they were given a ceremonial significance. The referent was the two-horned Koshare figure of the Southwest. Some time must have been involved in the transmission, and it could not have been done directly by people familiar with the use of the specimens unless, of course, something happened to the carriers before any opportunity existed for them to make known the use to which the tools were intended to be put. A faint possibility of an explanation might be found in ascribing the transport of them to Athapascan migrants who in turn traded them to people with whom they later came in contact, both groups being impressed by the novelty of the tools but unaware of their use. Whatever the method of transmission, a minimum of age is established for the two-horned muller of A.D. 1540.

We thus have a series of cross dating possibilities extending from very early in the occupation of the Klamath Lake area down to 1540. To be sure, not all are of the same degree of preciseness but all can be used for our purposes.

ABSOLUTE CHRONOLOGY

Three dates may be used for absolute chronology in the Klamath Lake area. These are (1) the date of the eruption of Mount Mazama which spread a blanket of pumice over a great area, (2) a C-14 date on a house pit, and (3) the treaty with the Klamath Indians which gives us a date for the villages at contact time.

1. *The Mount Mazama date.* The date for the Mount Mazama eruption, an average of four runs, is 6,453 ± 250 (Libby, 1951: 86) years ago. Since the Mount Mazama pumice occurs as a deposit in Medicine Rock Cave in such a manner that it can be associated with the eruption, this date can be used for dating that deposit.

2. *A house pit excavated in 1951, KL-9.* This was dated (Libby, 1954: 739) at 430 ± 165. This permits the assignment of a construction date of just after A.D. 1500 if the tree which was used was living at the time it had been taken for a house timber. This house pit and its relation to the midden house pits have been described (p. 442). We also pointed out that the house had been abandoned some 300 years ago in view of the tree which had grown in the pit. So a maximum range for the use of the pit would be from about A.D. 1500 to 1650. Unfortunately no artifacts were found in the fill, only a well-developed structural plan.

The head man, Lalo, who was one of the treaty signers had told his grandchildren that the midden houses had never been used by his people but by the "old people" of long ago. He was undoubtedly familiar with the traditions of his people, and it is safe to assume that the village site in the timber in which KL-9 was situated was of considerable antiquity. It, at any rate, gives us a minimum date for the abandonment of the midden pits. In view of the fact that the midden pits produce only the incipient two-horned muller and by 1540 the fully developed type has appeared at Pecos and in the Chama, it would seem that the date of A.D. 1500 for the midden abandonment is too conservative.

The initial date for a house pit among the Klamaths is difficult to establish because of their practice of reusing the pit while reconstructing the framework.

3. *The signing of the treaty between the Klamaths and the United States Government.* The treaty was signed in 1864 and the reservation established in 1866. The earlier date may then be taken as the final one by which Klamath aboriginal culture is dated. Since the Agency authorities were interested in making "white men" out of the Indians as rapidly as possible, especially in the matter of houses and methods of living, the treaty date or reservation date may equally well be taken as the final one for the pre-contact village sites. However, villages existed into post-contact times and the use of aboriginal tools continued, but this is a part of the phase of acculturation.

CHRONOLOGY OF THE KLAMATH LAKE AREA CULTURE

Chart 3 presents the estimated chronology of the culture of the Klamath Lake area and gives reference dates from absolute chronology in the Klamath and adjacent areas. We do not know when the midden was started. However, since there was an unknown depth of occupation under the skeleton 11-222, which was that of the man killed by the Lower Klamath Lake type of bone projectile point and side notched atlatl point to which may be given a minimum date of 7,000 years ago, and possibly more, then the occupation must have started well before that period. Other skeletons were below the "kitchen" in which 11-222 had been buried and the occupation materials went below them and below the present water table. In view of the 9,000 C-14 date for Fort Rock and probably an earlier date for Paisley Cave No. 3, the midden could have started 9,000 years ago or earlier. A terminal date of 7,500 years ago has been assigned to Level IV, since 11-222 was buried into the top of it. Level III has been extended to 3,500 years ago. Population disturbances related to the onset of the Altithermal in the Great Basin would have made themselves felt particularly in the early stages of the period. With the shift of climatic changes toward the approach of Medithermal and the beginning of improved habitat conditions, it would be expected that the Basin would again become available for hunting peoples on the move. The appearance of the small points and the evidence in other artifact types of some kind of impetus in the third level, probably late, suggest the arrival of new stimuli, probably in the form of bands coming again into the area. The terminal date for Level III is, therefore, put at 3,500 years ago, covering the beginning of the Medithermal.

Level II shows the continuation of the influences beginning in III and finds the adaptation to the ecological conditions worked out in the form of food habits and the change in point types. In view of the data on the "small points" and on the assumption that, while some may have been autochthonous, the main reason for their appearance was their introduction by new immigrants moving slowly from north to south over the western part of the continent, and the appearance of the points could be expected earlier in the north than in the southwest, we have terminated this period at 2,500 years ago.

Level I is terminated at A.D. 250 and the Kawumkan Springs Midden house pits at A.D. 700 largely on the basis of the C-14 date for KL-9 at A.D. 1500 and the cross dating with the Pecos date for the two-handled muller at A.D. 1540 and the assumption that the village house-pit system of dwellings took some time to develop and the stone technology also required many years for its development. This gives a period of nearly 500 years for the occupation of the midden surface by the users of the house pits.

The Kawumkan Springs house pits may or may not have lasted throughout the whole 500-year period; I am sure they did not and that the abandonment took place well before the date of the building of KL-9 with its C-14 date of about A.D. 1500.

The precontact villages with the fully developed culture known at the ethnographic level start at an uncertain date and were in existence at 1500 and to the signing of the treaty in 1864.

It will be noticed that there is the assumption that the Kawumkan Springs Midden house pits are the earliest manifestation of this phase of culture. We have no proof that they are but there is no evidence of any earlier ones, and, since these occur on a site used for an enormously long time, the assumption is reasonable. The midden house pits may perhaps be cross dated

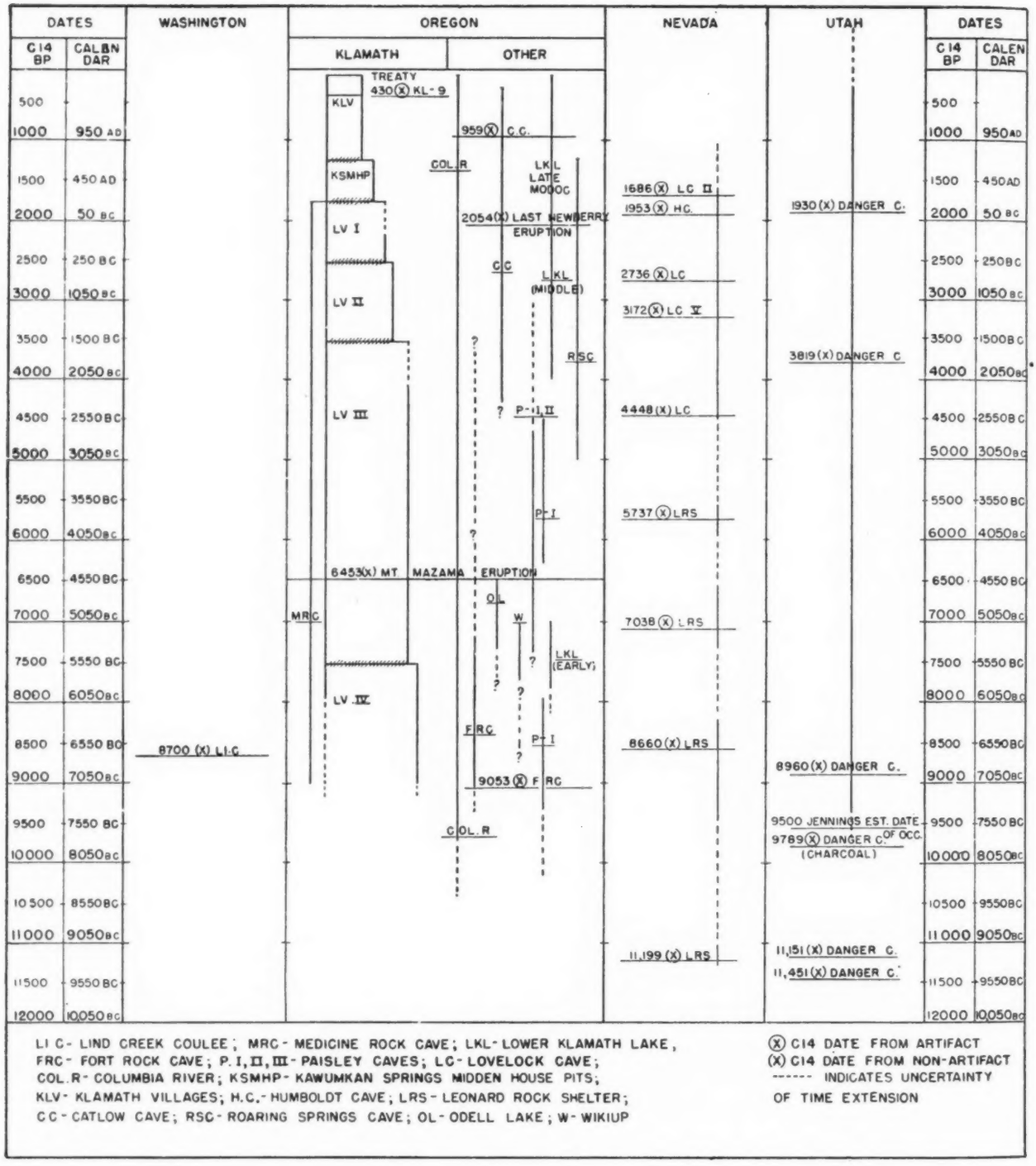


CHART 3. Suggested time relations in the Northern Great Basin cultures.*

* After this manuscript went to press the Geochronological Laboratory of Yale University published the following statement of age determination of a dry sample for the Mount Mazama eruption. This date gives a somewhat greater age to all events dated by reference to the Mount Mazama pumice horizon than used in this chart.

"Y-109 *Paisley Cave, Ore.* Rodent droppings from Paisley Cave No. 3, immediately under the pumice layer from the Mount Mazama eruption that formed Crater Lake. Col- 7610 ± 120

hesitatingly with the Basket Maker II (Morris, 1941) and placed at A.D. 200 by dendrochronology. This would indicate then a fairly long occupation of the midden with re-use of pits. The beginning of the Klamath type of villages is estimated at A.D. 700. This suggested chronology is used on chart 3. In view of the slowness of change at a simple level of culture, the above dates do not seem out of line.

The occupation of Medicine Rock Cave brackets the date for the eruption of Mount Mazama at 6,500 years ago with the longer period of occupation after that date. The earliest occupation of the cave may be before 7,000 years ago. On the chart 7,000 years ago is given as the certain date with uncertainty indicated before that time.

As pointed out in Chapter IV on Medicine Rock Cave, there is indication of a period of abandonment at a late period. Any date on the start of this period is a guess but with the possibility that the abandonment is associated with the development of Klamath religion as known ethnographically the date of A.D. 200 is suggested, approximately the date given for the abandonment of the Kawumkan Springs Midden.

The renewal of use is estimated to have begun after the treaty was signed in 1864, this date being taken as the culmination of Klamath aboriginal culture.

Medicine Rock Cave thus provides a long time reference overlapping the occupation of the midden, a period of abandonment, and reoccupation.

No one knows more clearly than the writer that these dates for the beginning and ending of periods may miss the mark. The fact remains that the Klamath area has been occupied continuously for a long period of time without a break. The occupation of the sites overlaps sufficiently that a reasonable culture column can be constructed. The construction and interpretation we have made is not unreasonable when compared to the known data for the Great Basin as a whole and for the Northern Great Basin in particular. Finally, such a statement of a cultural continuum and its separation into developmental stages will provide a theoretical construct which is subject to validation by later workers.

XII. THE RELATION OF THE KLAMATH LAKE AREA CULTURE TO THAT OF THE GREAT BASIN

STATEMENT OF POSSIBLE RELATIONSHIPS

Since this study has been one in depth any comparison with the Great Basin should be made in historical perspective. That is, the determination of relationship of the two areas must be evaluated at the different periods of the historical development of the areas. The relationship between two areas may be such that the one is included in the larger as a part of it, or the culture of the one may be derivative of the other, or there may be a basic similarity between the two with an orientation of one toward some habitat features peculiar to it that serves to give it a color or character which makes possible its localized differentiation from the other culture. In addition to these possibilities there is that in which the cultures of the two areas are initially alike but, owing to historical accident such as some environmental change which impinges on one but not the other, the cultures may diverge along lines of different adaptive responses and develop quite distinctive characters after the passage of time. Or we may find a situation where two cultures are initially rather different, then owing to acculturation processes the one impresses itself on the other for a period of time only to find that because of some historical accident and internal processes they again diverge.

EVIDENCE OF RELATIONSHIPS

Relationships with the Northern Great Basin as implied by the projectile point types have already been discussed in Chapter V. Briefly it was pointed out that when we grouped the "Great Basin" points and the "small" points and treated them as units in Level IV, the Great Basin type was third in preference and the small fourth in a series of the four most popular styles. The leaf-shaped Type 11 was the preferred type with the stemless Type 12 second. In Levels III and II the order of preference changed with the Great Basin types second, the small third, and Type 12 fourth. In Level I the small types hold first place, 11 is in second place, and the Great Basin (larger) variety is third, with 12 fourth. There is good reason to believe that both Types 11 and 12 represent varieties of an early type of stemless projectile point that was very widely spread but not to the exclusion of the stemmed varieties in the Great Basin. If this is the case then the appearance of the Great Basin points in Level IV shows a limited use of the same kind of projectile points as occurred over much of the intermontane region. On the other hand, the Type 11 seems to have a closer relationship to the early Columbia River points than to any others, as has been pointed out earlier. The Great Basin relationship becomes more marked in Levels III and II and in Level I with the dominance of the small "Shoshonean." On

lected in 1951 and submitted by L. S. Cressman. *Comment:* the Chicago laboratory (11, p. 117) obtained a mean date of 6450 ± 250 years for charcoal from a tree killed by this eruption (sample C-247). Doubts have been expressed about the Chicago date in view of the possibility of postdepositional exchange of carbon from ground water. Paisley Cave is dry and the sample is free from this objection; the acetylene date is significantly older by a small margin but probably does not change the geologic picture (15)."

(Preston, Person, Deevey, 1955: 958)

the other hand, it must be kept in mind that there was a proliferation of point types in the Oregon area in late times. We may be dealing with two processes, a diffusion into the area of a series of types which characterize the area of the Great Basin as well as certain processes tending to proliferation of types, given the materials with which to work, in this case "small projectile points."

Other artifact series such as the mano and metate show (throughout the occupancy of the Kawumkan Springs Midden) the same kind of utensils as the neighboring Great Basin. The same holds for shaft smoothers. With the post-midden period a marked change occurs in the grinding tools showing a variety of forms developed for the exploitation of the *Wocas*. Choppers, drills, and what few bone tools there are tell the same story except that antler wedges are absent in the Great Basin with only two found late in the midden. The great point of difference lies in the scrapers for, while the Great Basin had a well-developed knife and scraper industry adapted to use of butchering large game, these are almost non-existent in the Klamath area except for the small spall scrapers of which we found so many. This difference is undoubtedly due to the difference in the food habits of the two regions, the use of mussels, fish, birds, but little game.

The most significant difference we find between the Klamath area and the neighboring Great Basin is in the food habits. The separation of practices in this category is progressive. While some fish were eaten during Level IV there was the customary wide range of food characteristic of the Northern Great Basin practices. Game was not an exclusive item but the adjusted figures show a certain reliance on it. In Level III the increase in the use of fish begins to become apparent and in Level II fish provide the major article of food, thus indicating the separation from the old patterns of the Great Basin. The other animals, such as rodents, become a minor item while birds (waterfowl) become second in importance and game is a poor third. The swing away from the early practices in this instance may be correlated with the development of techniques for exploiting the river and marsh resources of the habitat. Game was apparently abundant enough, if present conditions may be used as an indicator of the past, but it ceased to have any strong appeal to the occupants as a food item.

In the discussion of the food habits and ecological adaptation the development of grinding tools was discussed. It was pointed out that throughout the history of the midden the grinding tools characteristic of the Northern Great Basin, the oval mano and slab metate, and the mortar and pestle were the only ones in use, with the exception of a somewhat more carefully shaped mano of pumiceous material. Then during the period of the midden house-pit occupation a series of innovations in manos took place leading to the series intended for *Wocas* exploitation characteristic of the precontact period. The development of this inventory of grinding tools for a special purpose sharply sets the Klamath culture off from that of the Great Basin. Here again is a differentiation due to the exploitation of a local resource. Since these tools are distinctive of the Klamath Lake culture their development must have been due to internal causes and not diffusion. What ideas lay back of their development we shall never know. It is certainly likely that *Wocas* was used as an article of food before the development of these tools for its better exploitation, but this technological improvement is a striking case of innovation by these people to meet more effectively their problems of food preparation.

The case for perishable artifacts eludes us but some inferences may be made about basketry. Klamath basketry is distinguished from Catlow twine of the Northern Great Basin caves only by the method of starting the basket. However, I have never seen false embroidery used on a Klamath basket and it was used on some of the cave specimens. Indeed fragments of false embroidered Catlow twine were associated with the sandals dated at 9,000 years ago from Fort Rock Cave. The materials used for baskets, the methods of decoration, the decorative patterns even to some extent, all except "the method of starting" among the Klamath are those of their earlier neighbors to the east and northeast. It is entirely probable that the method of starting the basket used by the Klamath represents a localized improvement in techniques as was the case of the grinding stones. In view of the long time relationship of the culture of the Klamath Lake area to that of the Northern Great Basin even though it gradually diverged to provide a thoroughly local series of patterns, the most logical explanation of the Klamath basketry is that it is a localized development out of the varieties of twined ware found over a long period of time in the Northern Great Basin. Some of the more complex twined patterns of the earlier periods disappear and one new trait, the method of starting, is added but that is all. Attention should also be called to the continued use by Klamath women of the shredded sage brush bark skirt in shamanistic performances, in all likelihood a survival in ceremonial practice of an earlier dress style shared with the Great Basin.

REASONS FOR THE KLAMATH AREA SPECIALIZATION

The major reason for the specialized cultural development of the Klamath area is doubtlessly to be attributed to the distinctive local ecological conditions and the gradual concentration of the people on the exploitation of the riverine and marsh resources. The evidence shows that there was early contact with the neighboring Basin people and that this contact was probably stepped up in intensity in the form of conflict about the end of the Anathermal. With the partial depopulation

of the Great Basin during the Altithermal the occupants of the Klamath area would have been in a relatively isolated pocket pretty much free to live with little contact with outsiders either as friends or enemies. During this period one might reasonably expect the establishment of the basic patterns of the culture, conservative and self-sufficient. The Medithermal brought new inhabitants into the neighboring area and with the increase of population a period of contact would have been established. The former isolation had gone. If Klamath patterns of prejudice can be used as indicators, then their hostility toward and contempt for the Paiutes would suggest that the relationships with the new Great Basin occupants were not friendly. The fact of contact exists. Contact with the Modoc on the south and the Warm Springs Indians on the middle and lower Deschutes to the north also existed and was friendly in contrast with the attitudes toward the Paiutes.

The analysis of the non-material culture of the Klamath by Spier shows a series of patterns many of which were borrowed from the Northwest coast, central California, and the Columbia River areas. The presence of these traits shows that the Klamath were receptive to new ways and able to integrate them into a functioning whole. This seems to be somewhat in conflict with the suggestion of conservatism advanced above. However, they could still have been conservative as indicated by the archaeological evidence, and at the same time receptive to new ideas either internally developed or received from outside, as long as the ideas could be used in their way of life. The capacity to innovate is shown archaeologically in the change in food habits, the accompanying technological improvements internally developed, and probably in the basketry fabrication. Perhaps the increased rate of contacts associated with the population movements of the Medithermal may have brought the ideas which found ready but selective acceptance by the occupants of the Klamath Lake area. The Klamath attitude described by Stern (1950) as "permissive variation about a norm" may well be the realistic solution to problems developed during the history we have described.

CHANGE IN GEOGRAPHIC RELATIONSHIPS

The dynamics of population movement of the late period brought about a final reorientation of the people of the Klamath Lake area. In the early part of their history there was the orientation toward their Great Basin neighbors with probable contacts with the Columbia River to the north. This was followed apparently by a period of more or less isolation in a favorable habitat with little evidence of outside relationships. Then with the improved climatic conditions of the Medithermal and the population movements associated with it the orientation of their relationships had turned away from the Great Basin. Now they were with the western area, that is with the Pacific Northwest coast, the Columbia River area, and central California. Contact with the Columbia River area was mostly intermittent until perhaps the middle nineteenth century when it became more regularized. What the situation was with regard to central California we do not know in detail. In all likelihood the coastal influences were derived by way of Klamath River contacts with the Yurok and their neighbors. At any rate, the cultural and geographic relationships of the Klamath Lake populations had at the precontact period undergone a complete reorientation, although in the material culture there is retained a core of Great Basin relations.

SUMMARY

In this chapter we have pointed out the various kinds of relationship that may exist between cultures of two adjacent areas with special reference to accounting for degree of similarity or difference through time. It was shown that in the earliest period of the Klamath Lake area culture there was a certain similarity between the manifestations of the two areas in the projectile points but this may have been a common sharing of the widespread patterns of stemless points. Then in Levels III and II Great Basin points were more prominent than earlier but the local stemless variety continued to lead. The small points became more to be preferred in these two levels than earlier and in Level I were the most popular. This sequence of points and the changes in preferences were interpreted to mean the development of the early Great Basin influence and the small point dominance the introduction of the Shoshonean type of points and the addition of new forms as a result of localized innovation. The subsistence pattern in the beginning was closely related to that for the Northern Great Basin with a small percentage of fish added to the diet. This pattern began to diverge in Level III and by Level II the characteristic Klamath pattern of animal use for food with its main dependence on fish had developed, thus separating it effectively from the Great Basin patterns. The most striking other change in subsistence is indicated by the evidence of more effective exploitation of the *Wocas* primarily with regard to its preparation, but perhaps, too, it must be admitted, its development as a more important item of diet. It was postulated that the basic patterns of the Klamath culture were "set" during a period of isolation during the Altithermal. With the population movements that occurred during the Medithermal new contacts were established, and the orientation of interest and contact of the Klamath were now toward the western regions. By the time of contact the non-material culture reflected a series of patterns based upon the integration of traits or values borrowed from a variety of sources, central California, the Columbia River, and the Pacific Northwest as points of origin.

XIII. SUMMARY AND CONCLUSIONS

On page one it was stated, "This paper is concerned with the prehistory of the Klamath Indians or, to be somewhat more precise, the prehistory of the culture of the area now occupied by the Klamath in south central Oregon, and the relation of this culture to that of the Great Basin." Cressman (1942: 140) wrote:

> The rest of the history of south-central Oregon consists of the struggles of wandering bands of Paiute, always on the verge of starvation and frequently over the border, while in the Klamath basin the Klamath-Modoc culture developed, carrying on the basic elements of the lake-marsh type of culture developed perhaps around the remains of the great Pleistocene lakes to the east.

Spier's study of the Klamath had shown that for their non-material culture the Klamaths were far removed from the late Great Basin groups and had a culture into which had been integrated a variety of borrowed traits from their neighbors in the west, south and north, but there were some material aspects of their culture that were local in nature, while others manifested a relationship to their Basin neighbors.

Four sessions of field work, beginning in 1947, were devoted to the archaeology of the Klamath Lake area. There were two aspects to the program intended to provide a sound answer to our question. First we hoped to get a cultural continuum in the Klamath area from the earliest time to the contact period and we hoped that this record would show the relation of the culture through time to that of the Northern Great Basin as well as give us the developmental history of the Klamath culture as far as that could be secured from open sites.

We discussed the Klamath Lake region as a habitat area showing its ecological features which separated it from the Great Basin at the present time and pointed out the evidence that at the end of the Pluvial period there was little reason to believe that there was much difference in the neighboring Great Basin from the Klamath area. The Klamath Lake basin because of the perennially flowing rivers and springs and the extension of the precipitation from the Cascade Range on the west was largely unaffected by the climatic variations of the Neothermal that were so marked in the Great Basin proper.

With the habitat setting of the Klamaths before us we discussed briefly the Klamath culture of immediate precontact times as a cultural referent for the archaeological record to follow.

The archaeological record was then discussed according to the three sources of record, Medicine Rock Cave, the Kawumkan Springs Midden, and the house pits. Medicine Rock Cave showed occupation beginning before 6,500 years ago since a stratum of Mount Mazama pumice served as a time reference in the deposits. The cave after the pumice deposition was occupied probably seasonally and over a relatively small area. The remains were very scanty, consisting of a few stone implements, some bone tools, the remains of fish, and a few animal bones. Since in pre-contact times caves were avoided as spirit places the long use of the cave as a place of living, even for small groups, would indicate that this part of the religious system of the Klamaths had not yet developed. Then a period of abandonment of the cave occurs and the time represented by the deposition of this sterile layer may be associated with the idea of the cave as a place to be avoided. Finally occupation again occurs and is associated with the beginning of acculturation and the breakdown of the aboriginal culture.

The Kawumkan Springs Midden we estimated to have covered a period from at least 7,500 but possibly 10,000 to perhaps 1,700 years ago. Perhaps this terminal date is too late. The midden we divided into four levels based upon the method of excavation and presented the results according to the manifestation by Levels. It is possible that if we had used twenty rather than forty centimeter levels we could have been somewhat more precise in our statements of the approximate point at which changes occurred. However, in view of the time and money factors affecting our excavations, we had to use these measurements and were justified in doing so because of the lack of any clear-cut geological stratigraphy in our exploratory trench (a general midden condition borne out by the excavation). On the basis of the methods used we have formulated statements of change in technology, subsistence patterns, and external relations, for the period of the use of the midden.

The midden provides a record of the change from a very widespread subsistence pattern, using about everything the habitat provided as food animals, to one in which the range is restricted and the dominant article is fish. By Level III the occupants were learning to exploit the runs of salmon from the sea, the trout and the suckers in the rivers, as well as continuing the very heavy use of mussels which was a pattern of the previous Level. With the increased use of fish and waterfowl there went a reduction in the amount of less desirable animals such as rodents and carnivores, while game never was really important after Level IV. In the economy heavy reliance was placed on roots and seeds and with the abandonment of the midden changes occurred in the tools for exploiting the *Wocas* which produced a series of tools at least one of which is distinctive for the Klamath Lake area. However, this change had not taken place during the use of the midden.

The major changes in technology shown by the midden was in the types of projectile points. Here there is a dominant style, our Type 11, leaf-shaped with a slightly constricted base, but with the larger Great Basin types becoming more prominent in Levels III and II to be displaced during Level I by the small Shoshonean

type of point. Manos and metates were shown to be more numerous than mortars and pestles but both types of tools were used during the history of the midden. Choppers, sometimes the core variety but more often a large flake, were numerous and were probably used for cutting up wood and larger animals.

Scrapers are almost uniformly small, reflecting the subsistence pattern of dependence on small animals, fish, and mussels. In this there is a striking difference from their Great Basin neighbors who relied heavily but not exclusively on large game animals.

One of the impressive characteristics of the stone artifacts other than the scrapers and projectile points from the midden is their large size as was shown in figure 46. The great size of some of the metates has been discussed.

Only a limited number of bone artifacts was found and in view of the preservative qualities of the midden there is little reason to believe that bone was ever used to any extent for tools. The most significant bone artifact, the bevelled bone point found in the body of one of the occupants of the midden, almost surely came from outside the area, Lower Klamath Lake.

The only evidence of shelters or living areas from the midden consists of the built-up stone platforms in the top of Level IV and bottom of Level III which we have called "kitchens." House pits were dug into the top of the midden and are obviously post-midden.

The dwelling patterns were next discussed. Spier had given a description of the Klamath house types for the ethnographic horizon. The archaeological record did not show house pits until after the abandonment of the Kawumkan Springs Midden. On the basis of informant information and the artifact typology it was inferred that the midden house pits were the earliest, followed by those in the vicinity of the Kawumkan Springs in the area that is now forested, some with the villages on the lower Sprague River and the Williamson lasting to this historic period. The structure of the houses from the archaeological record, with the possible exception of KL-9, showed considerable variation from the features described by Spier. Since the Klamath had the practice of cleaning out a pit and re-using it evidence of earlier plans would tend to be obliterated. The practice also makes it impossible to give any reasonable estimate of the length of time a pit was in use. The archaeological record shows saucer-shaped house pits, frequently having a bench around the pit. Most of the houses have no indication of posts having been set *in* the ground. Many of them were destroyed by fire. The Klamath burned a house in which a death had occurred and this may account for some of the fires. However, since mats and pine boughs were used in the construction of the roofs it is likely that many of the fires were accidentally caused. Our records are those of the final use of the house in each case and the evidence of burning, if accidental, gives a finality to the occupation picture that is difficult to accept. On the other hand, if the houses were burned because of deaths having occurred in them, then the small number of unburned ones raises questions in one's mind, such as what happened to the survivors, where did they go to live, and such, that are impossible to answer. The appearance of the saucer-shaped pit may be related to a roughly similar type of structure described for the Durango region from Basketmaker II by Morris possibly indicating the earliest type of semi-subterranean house in the Anasazi area, having a dendrochronological date of A.D. 200. If such should be the case, then the Kawumkan Springs Midden house pits should probably be put earlier than has been done in this paper.

The artifacts from the house pits were next discussed with those from the Kawumkan Springs Midden surface showing the beginning of the development of the grinding tools associated in their fully developed form with the exploitation of the *Wocas*. Otherwise the stone-working tradition of the midden occupants continued. Finally a distinctive feature of the collections from the Sprague and the Williamson River villages is the relatively few projectile points but the well-developed varieties of grinding tools, especially the two-horned muller or mano.

The subsistence pattern was next discussed on the basis of both direct and indirect evidence. It has been referred to immediately above and needs no further elaboration here except to point out that it reflects a gradual development of a type from a wide range of use of animals, roots and seeds, mussels and some fish to one based on fish as the main article of protein diet and *Wocas* as the dominant seed food. The food economy illustrates the gradual but finally completely successful adaptation to the riverine and marsh resources.

A number of dog skeletons were excavated from the midden. Since a few specimens came from the house pits and Medicine Rock Cave these were discussed together. Three varieties of dogs were found, the Kodiak Island small dog, the small Northwest Coast shell mound type, and the Siberian large dog. It has usually been accepted that these varieties appeared in time in the order listed. The stratigraphic evidence in general corroborates this theory. Dr. William G. Haag has given a detailed report on the dog skeletons in Appendix B.

Human skeletal material was found in the midden below Level I. Since the Klamath cremated their dead and have no tradition of any other method of disposal of their dead, except for an occasional slave or very poor person, this material is of considerable importance. Much of the material is fragmentary, consisting of parts of crania. One female skeleton, which is quite complete, and the skulls of two males permit measurements and observations. Dr. William S. Laughlin gives a detailed study of the human skeletal material in Appendix C.

We then attempted to formulate a chronology for the

development of the Klamath Lake area culture. We estimated the earliest manifestation at the Kawumkan Springs Midden at not later than 7,500 years ago but probably earlier than that, possibly 10,000 years ago, since, because of the water table, we could not get to the bottom of the deposits. The Medicine Rock Cave deposits were estimated to have started approximately 7,000 years ago. By means of cross dating with events for which an absolute date is known and with other events dated geologically and with cultural events for which an approximate time is given, a series of dates was worked out and is presented in chart 3. Major periods are associated with the major climatic changes in the Great Basin. The first occupation of Medicine Rock Cave is terminated at 3,000 years ago, while that of the Kawumkan Springs Midden should be about 2,000 years ago. The Kawumkan Springs Midden house pits follow on the abandonment of the midden but obviously they may not be *the earliest* ones, even though they are the earliest ones excavated and fit into the typological sequence for artifacts. The C-14 date of A.D. 1510 for the house pit, KL-9, gives an initial date for the final construction although certainly not the earliest for the site. The villages along the lower Sprague and Williamson Rivers extend to contact times, 1864, the date of the treaty between the Klamath Indians and the United States Government. Whatever the errors may be in the suggested chronology it is certain that there was continuity of occupation of the Klamath Lake area.

Finally we have attempted to relate the culture of the Klamath Lake area to that of the Great Basin, the second part of the problem with which we started out. We pointed out that both the Klamath Lake area and the Great Basin initially appeared to share some of the same traits but that soon the Klamath Basin people began to exploit the resources of the river and marshes, especially the former, and paid only a secondary interest to the game animals so important in the subsistence pattern of the early Great Basin people. However, for some time projectile point patterns in use in the Great Basin impressed themselves on the Klamath area and in the final stages of the occupation of the midden the small Great Basin points had displaced the favored leaf-shaped as the preferred variety. Until the occupation of the midden surface by the builders of the house pits there was no change throughout hundreds of years in the inventory of grinding, chopping, and scraping tools. If the house-pit occupants used the later practice of cleaning out a pit and re-using it, then the artifacts of the earliest use would have been thrown out to accumulate in the debris under the growth on top of the midden and the remains excavated from the pits would show the terminal type. The absence in the top of the midden of the developing grinding tools characteristic of the house pits would indicate that the initial development of the new types is contemporary with the terminal use of the house pits, and that the separation of the Klamath from the Great Basin peoples in the grinding tool inventory is to be dated from the final use of the midden house pits. The Klamath Basin peoples as a result of the exploitation of the riverine and marsh resources developed along a direction different from their Great Basin neighbors. In the later centuries as a result of the population movements probably associated with the ameliorating climatic conditions of the Medithermal the isolation of the Klamath was broken down and new contacts were established. These contacts took them in a different direction from their historic ones, this time toward central California, the Columbia, and the Oregon Coast as a mediator of Northwest Coast influences.

The archaeological record shows a continuity of development in the Klamath Lake region from perhaps 10,000 years ago until historic times. The culture originally a somewhat specialized facet of the hunting and gathering culture of the Great Basin and larger areas developed into a specialized series of patterns adapted to the exploitation of the particular ecological advantages of the habitat and to the extent that this occurred it diverged from the Great Basin manifestations. It maintained some of the contact with the early Great Basin culture as has been pointed out. Then, by borrowing from its newly contacted neighbors, it developed the integrated set of patterns in the nonmaterial culture with which we are familiar as "Klamath Culture."

The statement hazarded in 1942 and quoted above (p. 468) on the relation of the Klamath culture thus needs revision to the extent that, while there is a common ancestral element in the cultures of the two areas, the Klamath culture is no fossil relict of the early cultures of the Great Basin even though identifiable relationships may readily be seen. The Klamath culture is the product of adaptation to a favorable habitat with the dominating factor being the rivers and the marshes with their resources and because the area was not the victim of the climatic changes like the Great Basin the inhabitants in a fairly compact area had the opportunity to develop their patterns of adaptation. The people of the Northern Great Basin could be only hunters and gatherers and sometimes fowlers; they could never be fishermen. The Klamath could and became successful fishermen and this spelled the difference between significant development and mere survival. The Klamath culture then may be said to have been initially closely related to that of the Great Basin probably sharing in a common base and then to have gradually diverged but continuing to accept from it. Finally, some centuries ago the separation is for all practical purposes complete although on careful examination some of its traits derived from earlier times and indicating Great Basin affinities show themselves to the careful observer.

APPENDICES

A. ARTIFACT INVENTORY FROM HOUSE PITS

Long-I

1 section of barrel hoop
Manos—9
  Common type—2—well made
  Finger grip—1—grip not deep
  Raised top—1—little used
  2-handled—1—handle broken at top—scoriaceous basalt
  Fragments—4—common
  1 long grip or handle type. *Cf.* fig. 12-4 (1-12559)
Metates (all fragments)—3
Manos—pestle—hammerstone combination—2, one triangular-shaped in cross section.
Mortar fragments—2
Hotrocks—9
Chopper—obsidian—1
Arrow smoother—1—fine grain basalt, polished, grooved on top surface.
2 knives—obsidian—1-12600 73 mm. long—constricted base for hafting 1-12595 is 66 mm. long—1 curved cutting blade.
1 broken blade (obsidian) large
Scrapers—11
Drills—1—expanding base
Points—1A—1, 5A—1, 11A—2
1 antler wedge
1 fish gorge—50 mm. long
1 side prong from pronged fish hook—85 mm. long, 9 mm. wide at center
1 antler flesher—shaped like end of shoe horn
1 bone fragment, end of long bone, grooved as smoother probably for smoothing cord

Long-II

Manos—1—raised top—scoriaceous basalt—ridged handle offset from center
Manos—2 approximation to hemispherical, smoothed on one side only
4—fragments (1 stained with red paint)
Pestles—3—1 made of pumice; 1—a combination mano and pestle—flattened on two sides, rounded on other, 1 end flattened and rough, other rounded
Metate fragment—1
Hotrocks—2
Mortars—2—fragments
Cartridge case—1—(1-12739)
Bead—1—steatite, fragment 20 mm. long, 2 mm. thick, maximum diameter 15 mm. very shallow circular incisions, spaced about 3 mm. apart (1-12765)
Points—3—(fragments 7A-1, 11-1, and 12-1)
Knife—1—with 1 curved cutting edge (1-12775)
Scrapers—10
Awl—1—fragment, burnt
Side prong of 2-pronged fish hook (?) 49 mm. long (fragment), 8 mm. broad, 5 mm. thick—constricted in size toward base (1-12760)
Possible point for 2-pronged fish hook—1-12756 smaller than 1-12760
Flakes—1
Points—1B—1, 3—1, 10—1
Scrapers—15—1 large obsidian, snub-nosed—66 mm. long, 45 mm. wide, a curved flake of obsidian

Long-IV

Mortars—2—fragments—2 pieces of 1 bowl (1-12804), thickness of bowl wall at fracture is 70 mm., (1-12802) 80 mm. thick wall (maximum), very small bowl
Pestles—4—1 small whole one 95 mm. long, 50 mm. in diameter, not quite round, slightly triangular in cross section (1-12821)
  1-12801—section of pestle triangular in cross section, 35 × 40 mm. in diameter
  1-12799—rounded head of pestle
  1-12798—top pointed and triangular shaped in cross section
Manos—2—1-12819 is fragment also used for hammerstone, almost discoidal
Hotrocks—1
Arrow straighteners—1—(1-12800)
Projectile points—Type 3—1, 5—1, 7B—1 (small), 11A—1
Spall scrapers—15
Knives or long scrapers—3—long flake type 40–50 mm.
Antler flaker—1—(1-12678) 115 mm. maximum length, end bevelled
Bone awl (?)—1—(1-12822) badly chewed by rodents, 118 mm. length, 8 × 5 mm.

Lalo-I

Metal from fill: meat hook, cut nails, knife blade, piece of mouth organ, tin can, powder can (1-12645)
Stone club head—1—(?) basalt-girdled and dented for hafting, 67 mm. in diameter
Manos—1—roughly triangular shaped
Pestles—2—1 fragment and 1 rough but whole (1-12569)
Projectile points—7A—1, 11A—2 (1-12574 is whole but small, 38 mm. long but butt broken—original length about 41 mm.), 11B—1, 12—1
Scrapers—spall or flake—4; 1—well-shaped sides, like M. R. Cave type
Blades—1 fragment 50 mm. long, 31 at break, triangular cross section

Lalo-II

Metal—1 metal box—bearing name ELEY BRO.—London
1 metal piercing tool, 4 mm. long, 10 mm. wide at flattened base, rounded shaft 7 mm. in diameter
1 fragment of file, square in cross section
1 knife—handle iron is 15 mm. long to place where broken, blade is 53 mm. long
1 metal "strap"
1 piece of rounded flat metal
2 nails (cut, large)
1 safety pin fragment
1 cartridge case—large caliber

Bead—1 small blue, 3 mm. diameter from hole to hole, 4 mm. diameter on other axis; 1 fish vertebra bead

Buttons—1 white, 1 blue

Projectile point—1—base—Type 11A

Mano—2—fragments

Pestle—1—proximal end

Flake scraper or knife—1—basalt—82 × 52 × 11, one large flake, retouched around edges

Arrow smoother—1—1-12697—scoriaceous basalt. Grooved on both sides—groove 5 mm. wide at top

Sprague River-I, II, III

Manos—5—1 raised top with slightly prepared finger grip (1-12297)
1 almost hemispherical top (1-12302)
1 scoriaceous basalt—slightly rounded top (1-12300)
1 approximation to 2 handled type but only 1 knob

Metates—1—fragment very smooth, perhaps paint metate

Pestles—1—fragment of small specimen; 1—(1-12301)—shaped with small knob at top

Mauls—1—broken (1-12298) decorated, *cf.* fig. 69-1

Projectile points, Type 1A—2, 2A—1, 3—1, 5—1, 1 small-leaf shape, 20 mm. long and 7 mm. wide

Drill—1—(1-12284)—narrow, but widely expanding head

Scrapers—7—flake scrapers

Knives—2—or parts of blades or scrapers—long, narrow type

Sprague River-IV

1—Manos (1-123181) ridged back hand grip, centered

Gentry 1

1—tin can of stored pitch

1—knife blade

1—unfinished elbow pipe block (?) (1-12279)—very fine ashlike (probably diatomaceous), hole started in top

B. PREHISTORIC DOGS FROM KLAMATH INDIAN RESERVATION

WILLIAM G. HAAG

INTRODUCTION

Archaeological excavations in the northwestern area have revealed few dog skeletal remains, and documented specimens are rare. Despite the small number of canids in this collection from the Klamath Indian Reservation, the bones represent as large a number of dog skeletons as are reported from any northwestern state. Previous specimens all have come from the Puget Sound region. Thus a close evaluation of each of these specimens seems warranted although no full statistical treatment is justified. Certainly, some conclusions, even though subjectively conditioned, will indicate the general nature of the occurrence of aboriginal dogs in this area.

Seven specimens are sufficiently measurable to compare with dogs from other areas. Three additional specimens were recovered: (1) a pelvis (cat. no. 20-20) from Level II of the Kawumkan Springs Midden; (2) some vertebrae and a pelvis (cat. no. 20-139) from the Gentry Ranch house pit; and (3) a coyote skeleton (cat. no. 20-138) from the same site.

Ethnographic and historical accounts of the Northwest indicate the common presence of several varieties of a medium-sized dog. None of the descriptions of dogs includes any measurements, so it is difficult or impossible to correlate any skeletal remains with these described forms. Allen (1920: 469) described the Clallam-Indian dog from the Puget Sound region as a "medium-sized dog with erect ears, and bushy tail. Hair rather thick and wholly; white, or perhaps brown and black." Allen recognized the breed from descriptions given by early Northwest Territory travelers such as Hamilton Smith, George Vancouver, J. K. Lord, and Paul Kane. There is no reason to conclude that any of the present specimens may be classed with the Clallam-Indian dog. Allen also recognized another medium-sized dog which he named the Klamath-Indian dog. He found but a single reference to this dog supposedly limited in distribution to the Klamath River region of Oregon. According to Allen (*ibid.*: 463),

> Gibbs [in Suckley and Gibbs, 1860, p. 112] describes this dog: "On the Klamath is a dog of good size, with a *short tail.* This is not more than six or seven inches long, and is bushy, or rather *broad,* it being as wide as a man's hand. I was assured they were not cut, and I never noticed longer tails on the pups. They have the usual erect ears and sharp muzzle of Indian dogs, but are (what is unusual with Indian dogs) often *brindled gray.*"

The same author noted a short-legged Indian dog. From these accounts it may be seen that in historic times several varieties of dogs were to be found in the Northwest country from Puget Sound south to California, dogs generally classed as medium-sized or somewhat larger.

MEASUREMENTS

Recognizing that little work had been done on dog remains from North American archaeological sites, the author undertook the analysis of certain available materials and in 1948 published the results of this study (Haag, 1948). Since that time dog remains from Middle America and South America have been studied (Haag, 1954), but nothing has changed the conclusions reached in the previous study. In essence, these conclusions were that everywhere in the world older dogs are the smaller dogs; if there appears to be a correlation of dog size with cultural horizon (viz., smaller dogs with lower cultural position), this is more apparent than real—the correlation is actually with time. Conclusions reached then concerning dog remains in the Northwest may be strengthened or modified by this additional material.

TABLE 14

CRANIAL MEASUREMENTS

Measurement	20–17	20–18	20–21
Occipital length	—	177.0	—
Basal length	—	155.0	—
Condylo-basal length	—	161.5	—
Palatal length	—	89.0	78.5
Width at M^1	65.0	58.0	55.8
Width at canines	—	35.0	31.5
Width at mastoids	65.0	—	—
Width occipital condyles	36.0	33.2	—
Width zygomatic arch	103.7	96.0	—
Nasal length	54.0	52.0	—
Occiput-nasion	103.0	99.2	—
Orbit-alveolus I^1	—	75.4	—
Supraorbital width	52.0	46.0	—
Interorbital width	33.0	34.0	—
Cranial height	58.0	51.0	—
Least cranial width	35.4	33.9	—
Maximum cranial width	57.5	56.7	—
Meatus-alveolus I^1	—	141.0	—

As yet, no study has been made that clearly sets forth osteometric procedures that will serve to describe adequately a canid skeleton and validate its comparison with another for denoting relationships or contemporaneity. Presently, the general practice is to make as many measurements as possible and then make comparisons in as great a number as possible. In the case of these Oregon specimens such measurements as could be made on each skeleton are shown in the tables.

The specimens are arranged in no specific order of occurrence. The specimen of catalog number 20-17 was taken from Level I at Kawumkan Springs Midden. All its cranial and dental measurements fall within the range of measurements for the large canid types previously recognized in the western part of North America, namely, the Northwest Coast shell-heap type, the large Kodiak Island dog and the Siberian type (Haag, 1948). This latter type is established on living and prehistoric specimens of what is generally called the Siberian sledge

TABLE 15

DENTAL MEASUREMENTS

Measurement	20–17	20–18	20–21	20–22	20–137	20–140
Upper dentition						
I^1–M^2	—	91.3	97.0	—	—	84.5
C–M^2	75.5	73.8	65.6	—	—	68.8
P^1–M^2	—	61.0	54.0	—	—	—
P^2–M^2	57.4	53.4	47.9	—	—	—
M^1–M^2	17.0	17.0	16.0	—	—	—
Length P^4	19.1	16.8	16.2	—	—	—
Mandible						
I_1-M_3	—	—	—	—	95.8	—
C–M_3	89.5	83.5	—	—	89.8	—
P_1–M_3	—	—	—	—	72.0	—
P_2–M_3	71.2	63.8	—	—	68.0	—
P_3–M_3	57.9	54.3	—	—	58.5	—
P_4–M_3	46.2	43.5	—	—	46.5	—
M_1–M_3	34.7	31.9	—	40.5	33.8	—
Length M_1	22.0	20.5	—	25.4	21.9	—

dog. The skull of 20-17 is an excellent specimen but lacks the anterior portions of the premaxillaries, the maxillaries, and the palate. Nevertheless, the general conformation of the skull tends toward robustness. The frontal exhibits a pronounced bulbousness with hardly any sulcus apparent. The dog was fully mature but little tooth wear was evident. The skull conformation may be observed to be more like the Siberian dog than like the Northwest Coast shell-heap type. Individual measurements show that most are near the top of the shell-heap dog ranges but near the mean for the Siberian type. However, in maximum cranial width and interorbital width the measurements are actually less than the means for Northwest Coast shell-heap dogs, but all other measurements are quite near the means for the Siberian dog.

The marked similarity to the Siberian dog is borne out in the upper dentition and to the same degree in the lower, although only three mandibles are available for comparison (*ibid.*: 178). No comparative long bone material is available for Northwest Coast shell-heap dogs but again the measurements for specimen 20-17 are quite near the recorded measures of Siberian dogs. Hence, the conclusion that specimen 20-17 is a Siberian-type dog seems more justified.

TABLE 16

LONG BONE MEASUREMENTS

Measurement	20–17	20–18	20–23
Humerus length	148.0	140.0	155.0
Diameter of head	39.5	36.0	43.0
Transverse diameter	26.5	23.5	29.0
Radius length	145.0	135.0	160.0
Ulna total length	179.0	167.0	197.0
Length to notch	151.0	141.0	167.0
Femur length	163.0	156.0	178.0
Tibia length	153.0	153.0	171.0

Level II at Kawumkan Springs yielded dog remains (cat. no. 20-20) but these were fragments of a pelvis, material not readily lending itself to comparative techniques. In Level III was found a specimen (cat. no. 20-21) that permits a limited number of measurements and obviously is a fully mature adult. There is considerable, although not extensive, toothwear, but the second and third upper left premolars are broken out and part of the alveolus absorbed. The general appearance is that of a small, fragile dog, patently quite different from 20-17, the Siberian-type dog.

All of the measurements made are very near the lower figures for the range of measurements in the Northwest Coast shell-heap type (*ibid.*: 160). In one measurement, palatal length, the measure of 78.5 mm. is 1.5 mm. less than the minimum figure of the range of previously measured specimens of Northwest Coast shell-heap dogs. A closer resemblance is seen in similar measurements of Kodiak Island small dogs (*ibid.*: 187): the three measurements of 20-21 are quite near the means for equivalent measurements. In addition, direct observation indicates that this specimen is more nearly like Kodiak Island small dogs in general conformation than it is like Northwest Coast shell-heap dogs.

In the same level was found another canid specimen (cat. no. 20-22), but this proved to be the mandible of a wolf. The lower first molar (carnassial) had a length of 25.4 mm., which length is greater than that observed for any dog in previous studies. It approaches the carnassial length of female wolves for the Northwest area, *Canis lupus fuscus* (Young, S. P., and A. E. Goldman, 1944: 504). No other subspecies of wolf seems to have ranged into this Northwest area. The measurement is only slightly greater (.4 mm.) than the longest Eskimo dog carnassial reported in the literature, but it seems more likely that the specimen is wolf since Eskimo dogs were unknown so far south.

Also present in Level III at Kawumkan Springs site was a well-preserved skeleton of what appears to be a near-typical Northwest Coast shell-heap type dog (cat. no. 20-18). The individual cranial measurements with but few exceptions are quite near the means of known specimens of this type dog. From observations, the specimen may be seen to resemble closely the type; even though a sagittal crest is present, it is low, and a frontal sulcus is absent—traits somewhat typical of the Northwest Coast shell-heap dogs. Hence, it seems valid to adjudge this specimen to be of this category.

Long bones are present with 20-18, and it is unfortunate that there is no postcranial skeletal material of the Northwest Coast shell-heap dog with which to compare this. The lengths and other measurements clearly indicate a medium-sized dog. Of interest is a broken right femur, broken but completely healed. It was 27 mm. shorter than the left femur (fig. 55-2).

Bones of an immature specimen (20-19) were found in Level IV of the Kawumkan Springs site. Since epiphyses were not yet fused to the shafts it seems incautious to compare this specimen with any known types. However, it may be said that this would have been a medium-sized dog, maybe smaller than the Northwest Coast shell-heap but near Kodiak Island small dog.

The long bones (cat. no. 20-23) found at Long-II House Pit are almost certainly from a Siberian or Eskimo dog. In all the bone lengths the measures obtained fall within the range of known Siberian specimens except the radius and ulna which are much greater in length (Haag, 1948: 168, 173). There is no Eskimo material available for comparison but the postcranial skeletons of these two varieties are probably quite near in size. Presently, it must be judged that these long bones represent a Siberian dog.

At Gentry Ranch house pit canid remains were scarce. Mentioned above were the pelvis and vertebrae (cat. no. 20-139) which are not suitable for comparisons. Also found there was a complete skeleton of a coyote, *Canis latrans,* in what appears to be an intentional burial. The coyote was a young adult with fully erupted but unworn teeth and epiphyses not yet fused.

Two fragmentary specimens are from Medicine Rock Cave, viz., catalog numbers 20-137 and 20-140. The first of these consists of the left half of a mandible upon which certain dental row measurements may be taken. When these measurements are compared with the few available for Siberian dogs, close agreement is seen, especially in the length of the carnassial, M_1, a tooth length taken to be of some significance in denoting differences or relationships (*ibid.*: 178). On the other hand, these measurements are consistently beyond the measurements of two Northwest Coast shell-heap specimens.

Catalog number 20-140 permits taking a few upper dentition measurements. These all fall within the range of Northwest Coast shell-heap dogs and near the means except M^1–M^2 which is .4 mm. beyond previous range. When compared with Siberian dogs, the measures fall within the range but are quite near the lower limits and the measurement of 68.8 mm. for C–M^2 is below the lowest limit of the previous range by .7 mm. It seems more likely that this is a Northwest Coast shell-heap type dog.

DISCUSSION

Of the seven specimens capable of comparison with known dog remains, three (20-17, 20-23 and 20-137) are classified as Siberian; two (20-18 and 20-140) are Northwest Coast shell-heap type; and two (20-19 and 20-21) are Kodiak Island small dogs. In size, the Siberian dogs are largest and the Kodiak Island dogs smallest.

In the light of conclusions based on former studies the relationships of these dogs to their temporal horizon should be that the Siberian dogs would be the most re-

cently occurring specimens. This is, as stated before, an application of the conclusion that the larger dogs are the more recent. Supporting this theme is the fact that the two Siberian dogs at Kawumkan Springs (Level I and Long-II house pit) occur in the most recent levels there and the specimen from Medicine Rock Cave is at least relatively late in the whole time sequence.

A discrepancy that one would like to ignore is the presence of the Kodiak Island small dog at Level III of the Kawumkan Springs Midden. Perhaps, it is the occurrence of the Northwest Coast shell-heap type specimen also in Level III that actually seems out-of-place, since it occurs between two Kodiak Island small dogs (the other present in Level IV). Since the Northwest Coast shell-heap dog is not intruded from a higher level, two explanations may be offered: (1) the two types of dogs, shell-heap and Kodiak Island, were contemporaneous, the Kodiak Island small dog surviving long after the appearance of the Northwest Coast shell-heap dog; or (2) Level III at the point at which the Kodiak Island small dog was recovered is actually the first material accumulated at this part of the midden and thus equates in time with Level IV. Although one naturally would prefer the second explanation, rarely are clear-cut stratigraphic separations found in reality. It is much more likely that the Kodiak Island small dog was still extant when the shell-heap type was introduced.

Despite this anomalous situation, the presence of a Kodiak Island small dog in Level IV (the earliest accumulation at Kawumkan Springs Midden) suggests considerable antiquity. A short time ago it would have seemed compatible with other findings based on dog skeletal material to place the beginning date of this midden as of the order of 2000–1000 B.C. However, nearly every new disclosure of dog remains along the Pacific slope has tended to push the occurrence of this domesticate further back in time. Dog remains were unknown in California until Heizer found a specimen in the Early Central California culture. This specimen is another representative of the larger forms and has been equated with the Large Kodiak Island dog (Haag and Heizer, 1953). A radiocarbon date for this horizon would indicate that this dog was known in central California about 4,000 years ago. Previously, the author had judged that so large a dog would not have been in North America until quite late, but all such guessing must now be revised. Even so far south as Peru a medium-sized dog was present as early as the first millennium before the Christian Era (Haag, 1954). Thus it seems that the whole sequence of size of dogs must be extended farther back in time.

CONCLUSIONS

It may be seen that the dogs from the Klamath Indian Reservation strengthen the conclusion that large dogs are more recent than small dogs. The Siberian dog has been moved as far south as Oregon, the southernmost point it has been found. In addition, there is a strong suggestion that the Kawumkan Springs Midden is a site of considerable time range. Although stratigraphic relationships with other dog types were lacking at the time of certain former studies, it was concluded that archaeological specimens of Siberian dogs are not very old. Now, it would seem that these Klamath data easily extend the Siberian-type dog back two or three millennia before the Christian Era. It is pleasing to find that subsequent radiocarbon dates pushed back the Kentucky Archaic, where the dog is somewhat smaller than the Kodiak Island small dog, to approximately 3500 B.C. Although Ipiutak Eskimo culture has been dated at near A.D. 1000, and thus most of the St. Lawrence Island archaeological remains yielding Siberian dogs should be younger than this, it seems clear that the Siberian dog remains are not very specific time markers. In fact, it must be admitted with reluctance that relative size in dogs is only locally a good chronological aid. That is, because small dogs may be dated at 3500 B.C. in Kentucky, it is unwarranted to conclude that archaeological remains elsewhere with similar-sized dogs would be of similar date. By the same token, it would be naive to conclude that peoples of similar cultural status would have similar dogs, although initial investigations in this direction supported such a supposition. Nevertheless, it still seems clear that small dogs are everywhere earliest but as may be expected some small varieties continue even after the introduction of larger forms. The Kawumkan Springs specimens are important in supporting by stratigraphic relations this previously-stated conclusion. Using the correlation of dog size with time as a working hypothesis, it seems that Medicine Rock Cave should cover not so great a time span as the Kawumkan Springs Midden; yet the age of the last accumulation of both middens should be very nearly the same.

C. HUMAN SKELETAL MATERIAL FROM KAWUMKAN SPRINGS MIDDEN

WILLIAM S. LAUGHLIN

The skeletal materials described here provide sound information concerning the essential North American Indian character of the people who lived at this site. In addition, they strongly indicate significant differences in size, proportion, and frequency of non-metrical traits from those of the Oregon Coast and from the Kalapuya skeletons of the Willamette Valley. To a less marked degree they may be differentiated from the later Paiute or Shoshonean crania of eastern Oregon. However, there are two sources of error which make difficult the assignment of a discrete, local variety or estimation of degree of affinity with other North American Indian groups. First, the materials are scanty. There is not one complete male skull and there is only one

complete female skull. Thus it would be hazardous to consider this a sufficiently adequate sample for determining the precise nature of this geographical variant. Second, there are as yet no large groups from this same area with which they might be compared. Those skulls used for comparison, which come from southeastern Oregon, show many similarities to the males of the group being described. The intact female of Kawumkan Springs, however, is not so easily matched. As a consequence of these sampling problems, more attention is given to various non-metrical observations which have been found useful in describing other cranial collections. While these observations increase the number of points for comparison, their principal value has been to confirm the general conclusion that we are here dealing with a group of North American Indians. Their ultimate value will lie in future studies based on larger series. It may be worth while to note that the use of non-metrical observations not only has the potential value of employing traits whose presence or absence may be controlled by a single gene pair, or by very few genes, but that these traits are often the only kinds available for inspection in broken and fragmentary skulls. As will be seen in the ensuing description, it would be possible to identify these cranial remains into the category of northwestern American Indians on the basis of the frequency and combination of these traits, without recourse to the measurements of the vault. The preoccupation of many cranial studies with measurements, to the exclusion of these kinds of traits, limits the comparisons that can be made with other areas. Many more specimens would be needed to deal soundly with the problems of intra- and inter-group variability which are prerequisite to the problems of estimating the amount and kinds of differences between the groups separated geographically and in time.

No. 11-221 (fig. 70)

The remains of this person consist of the calvarium, a portion of the shaft of the right femur, and a small section of possibly the left femur, and the shaft of what is probably the right humerus, severely gnawed by rodents. The brow ridges are large and are exceeded in size by only one other Oregon Indian available for measurement, from Malheur Lake, eastern Oregon. The maximum thickness of the left brow ridge, measured on a line parallel to the Frankfort horizontal, is 15 mm. In harmony with the brow ridges is the massive supramastoid crest, especially the suprameatal portion (Keen, 1950: 71). The greatest breadth of the calvarium apparently fell between these crests.

A prominent Sylvian crest enhances the anterior inferior portion of the parietal bone which is thus 10 mm. in thickness. A crest of similar size is found on the right parietal. A parietal notch (incisura parietalis) occurs on the right side, but not on the left.

Endocranially the vault sutures have been obliterated with the exception of the squamous sutures, and possibly a portion of the right lambdoid suture. A provisional assignment of middle-aged adult may be made, with the best estimate in the region of forty to fifty years of age at death. Though the pressure of the earth has caused some distortion, the length and breadth measurements give a fair estimate of the cranial index, 73.0, and an additional centimeter in breadth would still place the index in the category of mesocrany.

The ear region is of interest owing to the presence of a dehiscence in the right tympanic plate, an indication of one in the left plate, and of exostoses in both ears (fig. 73-3, 4). The auditory meatus of the left temporal is closed by a large nodular exostosis which appears to have originated from the posterior surface. The right meatus is almost closed by two nodular exostoses, one coming from the anterior surface and the other from the posterior surface. They do not contact each other and it is possible to blow through the auditory canal.

No. 11-222 (fig. 71)

The skeletal remains of this person are more generous in both numbers of bones preserved and in the size of them. In addition to the calvarium there are portions of the maxilla, bearing six teeth on the right side, a mandible with 7 teeth, and portions of the long bones and pelvis.

This calvarium is characterized by medium brow ridges, the thickness of the left ridge being 10 mm. Neither the supramastoid crest nor the Sylvian crest is as large as in 11-221. A sagittal crest of moderate size continues down onto the frontal bone. The mastoid processes are large. A parietal notch is fairly well marked on the left but minor on the right side. The calvarium is considerably distorted, having been narrowed by earth pressure. A correction of as much as 15 mm. would place the index at 75.0, on the border of mesocrany. Complete closure of the sagittal suture, together with the patent or partially patent condition of the coronal and lambdoid sutures, suggests that this person was a young adult, possibly twenty-five to thirty-five, at time of death. The third mandibular molar and the third maxillary molar, of the left and right sides respectively, are not as worn as the second molars, and the second molars in turn show less wear than the first molars.

The maxilla is of large size and the roof of the palate is deep. The incisive foramen, like that of most northwestern Indians, is large. The remaining lateral incisor, right, shows pronounced shovelling. The mandible is characterized by a large right ascending ramus, with a minimum diameter of 45 mm. This breadth is the greatest encountered in any of the Oregon mandibles and is large, even among Eskimo mandibles. Unfortunately the left ramus is missing.

This breadth of ascending ramus (fig. 73-1) is large for contemporary humans and is exceeded only in such a race as the Eskimo-Aleut. Dr. Jørgen B. Jørgensen gives a range of 31–47 mm. with a mean of 40.2, standard deviation of 2.97 for 59 male mandibles from the Inugsuk area, and a range of 32–45 mm. with a mean of 38.3, standard deviation of 3.27 for 47 female mandibles of the same series; and again in a West Greenland series the same author gives a range of 29–51 with a mean of 40.9, standard deviation of 3.09 for 86 male mandibles, and a range of 32–46 with a mean of 38.8 and standard deviation of 3.16 for 72 female mandibles. (Jørgensen, 1953: 79. The use of the measurement M 71 by Jørgensen does not detract from the fundamental point that in this character the mandible under discussion is in the upper range of humanity.) Although yielding second place to some of the Eskimo groups, the mandible exceeds that of most Neanderthal men, Skhul IV (42.5) and La Chapelle 43 mm. (McCown and Keith, 1939: 230). The difference in size between this mandible and that of the female No. 11-236 suggests rather large sexual dimorphism, though this may have been the largest adult male in the population and she may have been the smallest adult female.

The mandibular molars are too worn to permit a certain identification of the fissural pattern; however, a plus pattern is indicated on the first and second right molars.

The left femur is sufficiently well preserved to permit reliable measurement. The bicondylar length is 433 mm. In mid-shaft size its antero-posterior diameter is 31 mm., and the transverse diameter is 30 mm. The femur is large and robust with a shallow hypotrochanteric fossa.

No. 11-224

With the exception of a mandible, lacking the two ascending rami, the remains of this person are exceedingly fragmentary. The absence of epiphyses from the proximal end of the right femur and the beginning emergence of the second mandibular molars suggest a probable age in the neighborhood of twelve years. The sciatic notch of the right iliac element indicates a male and the size of the right mastoid process is in agreement. The mandible is shallow but thick, and the chin is prominent. The second molars display a plus five pattern with a sixth cusp present on each. The occlusal surface of each of these presents a wrinkled appearance, as does the surface of the left third molar. Though the first molars are worn to the degree that it is difficult to identify the fissural pattern, they also appear to have had a plus five pattern with a small sixth cusp.

Beyond the observation that the right femur has a large hypotrochanteric fossa no other observations can be provided.

No. 11-225

This individual is represented by a fragmentary skull and pieces of a few long bones, none suitable for measurement. The remains are probably those of a female, roughly twenty to twenty-five years of age. There is no hint of brow ridges, and only an extremely exiguous glabellar eminence. The dental arcade is squared off in front and has a lightly developed palatine torus. There is only a slight sub-orbital fossa. The maxillary third molars are present but have not emerged above the level of the alveolar bone. The mandible is shallow with a symphyseal height of 30 mm. The third molars have not emerged. A plus five fissural pattern is evident on the first and second right molars, and on the second left molar. The mental trigonum of the mandible is well marked.

No. 11-226

Though no vault measurements can be taken on this fragmentary specimen, a number of significant morphological traits are in evidence. The remains consist of two parietal bones, two temporal bones, and one lambdoid bone, plus sections of long bones. The portion of the lambdoid bone remaining is clearly delineated on its inferior border by a moderately denticulated suture and thus constitutes one large inca bone. The supramastoid crest, similar in size to that of 11-222, and the size of the remnant portions of the mastoids suggest that this person was a male, and the absence of suture closure, together with the general size, suggests that he was a young adult. A well-defined parietal notch is shown on both the left and right temporal bones. A Sylvian crest, 8 mm. in thickness, can be seen on the interior of the right parietal bone. The corresponding portion of the left parietal is absent. On each of the tympanic plates is a large dehiscence, approximately 2 mm. in largest diameter. The auditory meati are elliptical.

No. 11-227

The remains of this specimen consist of the upper portion of the nasal bones, the frontal (right portion absent), part of the two parietals and occipital, all bonded by closure of the intervening sutures. Thus it is possible to secure a reliable cranial length, 185 mm., and a frontal height, 26 mm. The brow ridges are slight. The sex is probably female, though this estimate must be based on other series. A weak sagittal crest runs over the parietals and continues onto the frontal bone. Endocranially the sutures have all been obliterated. The superior sagittal sinus defers to the right.

No. 11-235

No bone of this skeleton is intact and only a few fragments are available. The identifiable pieces consist in portions of the frontal, probably the left parietal,

the occipital, the left mastoid, left horizontal body of the mandible, shaft of the left femur and also the shaft of the left humerus. A prominent supraorbital ridge (left), a well-marked chin and general thickness of the vault fragments clearly indicate that these are remains of a male skeleton. The superior sagittal sinus diverges to the right.

No. 11-236 (fig. 72)

Though a female, this specimen is sufficiently complete to provide considerably more information than the other skeletal remains of this series. The sex is clearly indicated by the absence of brow ridges, small mastoid processes, moderate development of the suprameatal crest, extremely small size of the head, general mild rugosity, and also pelvic bones which have long pubic elements, broad sciatic notches and small acetabulae. The ambiguous category of young adult is the closest possible assignation of age. None of the vault sutures have closed, either inside or outside. There is pronounced lipping of the glenoid cavities of the scapulae but the entire post-cranial skeleton has been severely affected by an osteological pathology which is manifested in many exostoses in the vertebrae, pelvis, and arm and leg bones. Dr. Clay A. Racely, a Eugene physician who specializes in diagnostic roentgenology, kindly made films of the skull and some of the long bones. Though this female was small in over-all size, no abnormalities were observable in the skull or long bones:

> Measurements of the sella turcica show a size well within normal range. There are no abnormalities in the bony structure of the skull. The cortex of the long bones appears within normal range and I see no evidence of deficiency change in the bones of either the male or the female, (a male Indian skeleton used for comparison). There is no evidence of abscess or destructive changes about the roots of the incisor teeth in the mandible.

The vault is quite low (auricular ht. 105.0 mm.), short (176.0 mm.), and narrow (130.0 mm.), yielding a cranial index of 75.0 and a mean height index of 81.7. In common with the males of this series she has a low frontal height, 22.0 mm. There is a well-marked parietal notch on either temporal bone. A large dehiscence occurs on each tympanic plate. The left plate has two small auxillary dehiscences. A well-marked transverse slit is also present on the free border of each of these plates. The sub-orbital fossa of the face is shallow. With the exception of one carious canine all the maxillary teeth are missing, and most of the alveolar ridge has been resorbed. Internally, the superior sagittal sinus turns to the right. The unusual weight of this skull deserves mention. As with the others there seems to have been some mineralization.

The mandible (fig. 73-2) is shallow and lightly built, but is endowed with a well-marked chin. The prominent lower corners of the trigonum place it in the category of a bilateral eminence. Most of the nine surviving teeth are worn down to the enamel line and the occlusal surfaces are highly eburnated.

The postcranial skeleton is characterized by an extremely light architecture, in marked contrast to the male skeletons of this series, and by an extreme degree of exostotic growth. A short stature is indicated by the lengths of the femora:

	Left	Right
Bicondylar length:	365.0 mm.	362.0 mm.
Maximum length:	370.0	367.0
Midshaft diameter		
antero-posterior:	22.0	23.0
transverse:	22.0	22.0

The second through the sixth cervical vertebrae are bifid. The ninth, tenth, and eleventh thoracic vertebrae have collapsed on the anterior side, producing a remarkable forward curvature. The fifth lumbar vertebra has been fused into the sacrum (Lanier, 1954); 13 thoracic vertebrae are present. The two ulnae had been broken, the right ulna in two places. In appraising the postcranial skeleton Dr. Racely suggests that rheumatoid arthritis is indicated.

For comparative purposes two series of crania were assembled, representing the surrounding population of south central Oregon, and the more distant and presumably Paiute Indian population, west of the Steens Mountain (Cressman, 1942: 141). The south central Oregon series does not represent a breeding isolate but rather contains crania from Abert Rim, Lower Klamath Lake, Fort Rock, Klamath County, and Lakeview.

TABLE 17

MEASUREMENTS

	11-236	*11-221*	*11-222*	*11-227*
Sex	Female	Male	Male	Female?
Age	Young Adult	Middle Aged 40–50	25–35	Adult
Length	176.0	191.0	204.0	185.0
Breadth	130.0	(140.0)	138.0	
Cranial index	75.0	(73.3–78.5)	(67.5–75.0)	
Basion-bregma height	125.0			
Mean height index	81.7			
Auricular height	105.0	(116.5)		
Frontal height	22.0	25.0	24.0	26.0
Facial length, total	(102.0)			
Facial length, upper	62.0			
Bizygomatic breadth	121.0			
Facial index, total	84.30			
Facial index, upper	51.2			
Minimum frontal diameter	86.0	94.0		
Basion-nasion length	98.0			
Basion-alveolar point	92.0			
Nasal height	48.0			
Nasal breadth	26.0			
Orbit height, left	33.0			
Orbit breadth, left	37.0			
Orbit index	89.2			
Nose length	48.0			
Nose breadth	26.0			
Nose index	56.5			
Nasalia, upper breadth	9.0	8.0	14.0	13.0
Palate, external length	48.0		60.0	
Palate, external breadth	(53.0)		(72.0)	
Bigonial breadth	92.0			
Bicondylar breadth	110.0			
Symphyseal height	34.0		38.0	
Minimum breadth ascending ramus, left	32.0		45.0(r)	

TABLE 18

NON-METRICAL OBSERVATIONS OF DISCONTINUOUS CHARACTERS

	Dehiscences	Huschke's Foramen	Transverse Slit	Auditory Exostoses	Parietal Notch	Direction of Superior Sagittal Sinus	Mylo-hyoid Arch
South Central Oregon							
11–8	0 L	0 –	0 –	0 –	R L	L	0 0
11–122	R L	– –	– –	– –	R L	Divided	– –
11–132	– L	R L	– –	– –	R L	L	0 0
11–133	– –	– –	– L	– –	– –	L	0 0
11–219	R –	R –	– –	– –	R L	R	– –
Malheur Lake (Blitzen River)							
11–69	R L	– –	R L	– –	R L	R	0 0
11–71	– –	– –	R L	– –	R L	L	0 0
11–73	R L	– –	– –	– –	R L	L	0 0
11–75	– –	– L	R L	– –	R L	R	0 0
11–76	– L	– L	– –	– –	R L	R	0 0
11–91	R L	– –	– –	– –	R L	Divided	0 0
11–92	– –	– –	R L	– –	R L	R	R –
Kawumkan Springs							
11–221	R L	– –	– –	R L	R 0	0	0 0
11–222	– –	– –	– –	– –	R L	R	– 0
11–223	0	0	0	0	0	0	0
11–224	0	0	0	0	0	0	0 0
11–225	0	0	0 L	0 –	0 0	0	– –
11–226	R L	– –	– –	– –	R L	0	0
11–227	0	0	0	0	0	R	0
11–228	0	0	0	0	0	R	0
11–236	R L	– –	R L	– –	R L	R	– –
11–235	0	0	0	0	0	R	0

0 = Bone missing; – = Trait absent; R = Right; L = Left.

There is the possibility that some of these may have been Paiute crania. The Malheur Lake (Blitzen River) series contains five crania from one archaeological site, Sod House, on Malheur Lake, and two crania from the Blitzen Valley, close to Malheur Lake. In examining the crania from these areas it appeared that one of the differences between the two series lay in the frontal bone. Accordingly, the measurements shown in table 19 were taken, by means of coordinate calipers (Woo, 1949). It should be noted that in this problem of discrimination the measurement of the frontal enjoys two distinct advantages over measurements of the entire vault. First, the series could be enlarged by including fragmentary specimens where the frontal bone was intact but the remainder of the skull unsuitable for other measurements. Second, the measurement describes only one unit of growth and thus is more comparable to similar measurements, whereas the over-all vault measurements are composite diameters to which several bones make varying contributions which are not distinguishable in the over-all measurement such as cranial length or breadth. (Mr. Jack Hegrenes, Research Assistant in Physical Anthropology, assisted in the measurements.)

An examination of table 19 shows several points of interest. The south central Oregon series is characterized by a higher frontal bone (mean subtense of 25.3 mm.), and also a longer frontal bone (mean chord length of 111.7 mm.). Turning to the Kawumkan crania, it appears that in height of the frontal bone they are more similar to the south central series than to the Malheur Lake series. A demonstration of the potential utility of this measurement is to be found in a re-examination of the Catlow Cave No. 1 skull, measured by Dr. Hrdlička and also examined by Dr. E. A. Hooton. (Cressman, 1942). Morphologically it appears to be more similar to these Kawumkan crania than to the later Shoshonean or Paiute crania of the Great Basin. The height (25 mm.) and length (114 mm.) of the frontal bone are in agreement with this observation. By contrast, the cranium from the Butte Creek Cave of northeastern Oregon, described by Dr. T. D. Stewart (1950: 385–387), displays the low frontal height (22 mm.) and short frontal length (108 mm.) more common to the later Indians of the Northwest, especially the Paiute Indians. Table 20 should, however, provide sufficient data for considerable caution in pursuing this difference. In both measurements

TABLE 19

MEASUREMENTS OF THE FRONTAL BONE

		Subtense	Chord	Index		
Malheur Lake Series (Blitzen River)						
11–69	M	24.0	111.0	21.6		
11–71	M	20.0	104.0	19.2		
11–73	M	22.0	111.5	19.7	Mean subtense	21.71
11–75	M	19.0	109.0	17.4	Mean chord	110.43
11–76	M	19.0	110.0	17.2	Mean index	19.64
11–91	M	23.5	113.5	20.7		
11–92	M	24.5	113.0	21.7		
South Central Oregon Series						
11–8	M	23.0	110.5	20.8		
11–122	M	26.5	111.0	23.9		
11–132	M	26.0	114.5	22.7	Mean subtense	25.3
11–133	M	26.0	108.5	24.0	Mean chord	111.7
11–219	M	25.0	114.0	21.9	Mean index	22.7
Kawumkan Crania						
11–221	M	25.0	114.0	21.9		
11–222	M	24.0	120.0	20.0		
11–227	?	26.0	114.0	22.8		
Catlow Cave No. 1						
11–62	M	25.0	114.0	21.9		
Butte Creek Cave						
11–218	M	22.0	108.0	20.37		

TABLE 20

MEASUREMENTS OF SOUTH CENTRAL OREGON AND MALHEUR LAKE CRANIA

	Cranial Length	Cranial Breadth	Cranial Height	Cranial Index	Height-Length Index	Height-Breadth Index	Nasal Length	Nasal Breadth	Nasal Index
Malheur Lake (Blitzen River)									
11–69	189.0	143.00	116.00	75.66	61.37	81.11	48.00	26.00	53.12
11–71	176.0	130.00	111.00	73.86	63.06	85.38	54.00	24.00	44.44
11–73	182.0	139.00	117.00	76.37	64.28	84.17	51.00	—	—
11–75	169.0	142.00	113.00	84.02	66.86	79.57	52.00	24.00	45.19
11–76	171.0	146.00	113.00	85.00	66.08	77.66	49.00	24.00	48.97
11–91	184.0	142.00	117.00	77.65	63.76	82.10	52.00	26.00	50.96
11–92	178.0	143.00	116.00	80.33	65.16	81.11	50.50	24.00	48.51
M =	178.4	140.71	114.71	78.99	62.94	81.58	50.86	24.67	48.53
South Central Oregon									
11–8	181.00	144.00	115.00	79.55	63.53	79.86	50.00	26.50	53.00
11–122	175.00	136.00	111.00	78.00	63.42	81.31	47.50	26.00	54.73
11–132	181.00	138.00	112.00	76.51	61.87	80.86	53.00	26.00	49.05
11–133	177.00	139.00	115.00	78.53	64.97	82.73	47.00	23.00	48.93
11–219	183.00	—	—	—	—	—	46.00	26.00	—
M =	179.40	139.25	113.25	78.15	63.66	81.19	48.70	25.50	51.42

and indices the two comparative series are amazingly alike and for all practical purposes may be pooled into one series. The significance of the difference in the frontal bone lies in the possibility that it might prove to be a consistent difference when larger series are available.

NON-METRICAL OBSERVATIONS OF DISCONTINUOUS CHARACTERS

The first five characters, all located on the temporal bone, have been selected because they are considered Mongoloid characters in the sense that they are of higher frequency among Mongoloid peoples such as North Chinese and Eskimos, than among American Indians who are semi-Mongoloid, and because they are discontinuous (Weidenreich, 1943). As indicated by table 18, no skull is lacking in all five characters, and at least one skull in each series displays a combination of three characters, though not the same combination.

The direction of the superior sagittal sinus offers no dependable help in discriminating these series owing to the small numbers available for observation. The fact that all the sinuses of the Kawumkan series diverge to the right provides a notable difference of course, but is based on only five crania. No published data are available for the mylohyoid arch. The presence of only one on a mandible of the south central Oregon series may be of significance when comparative data become available.

CONCLUSIONS

The skeletal materials described here indicate that the people who lived at these springs may be characterized by prominent chins, marked supramastoid crests, low vaults, large sex dichotomy, mesocrany, a large number of dehiscences of the tympanic plate, and by parietal notches. These traits are adequate to assign their owners to the category of North American Indians, and into the smaller category of Great Basin Indians as contrasted to Oregon Coast or Willamette Valley. The existence of local geographic variants is of course to be expected. Though the height of the frontal bone provides a clue to differentiating them from their Paiute neighbors, it is not possible to assume that this female cranium and the associated fragmentary skeletons are adequately representative of a breeding isolate. Consequently, no generalizations of this nature can be made.

D. IDENTIFICATION OF BIRD AND FISH BONES FROM KAWUMKAN SPRINGS MIDDEN

BIRDS

Dr. Alexander Wetmore, then Secretary of the Smithsonian Institution, wrote in part as follows under date of April 25, 1951.

> The bird material is highly fragmentary so that only a part of the specimens may be identified.

Following is a report by levels and numbers of the specimens that I have been able to name:

Level I—20-712, 20-711, 20-727	Goose. not det. to species
20-717	*Cygnus Columbianus* Whistling Swan
20-713	*Asynedesmus lewis* Lewis' Woodpecker
Level II—20-757	*Asio flammeus* Short-eared Owl
20-824	*Oxyura jamaicensis* Ruddy Duck
20-739	Duck, not det. to species
20-736	*Spatula clypeata* Shoveller
20-738	*Falco sparverius*
20-750	Sparrow hawk
Level III—20-764	*Anas platyrhynchos* Mallard
20-772	*Mareca americana* Widgeon
Level IV—20-776, 20-780, 20-838	Ducks, probably 3 kinds; not identified to species
20-847	*Xanthoscephalus xanthocephalus* Yellow-headed Blackbird (number blurred; may be 20-897, specimen is head of humerus, only bone of this kind in lot), A.W.
Level V—20-850, 20-852	Duck, not identified to species

FISH

Dr. Carl L. Hubbs of the Scripps Institution of Oceanography at La Jolla, California, examined the fish bones and wrote me under date of July 27, 1950. Dr. Hubbs, for various reasons, has been unable to give further study to these bones and his preliminary report is included here. It is clear from this report that salmon passed the falls at the south end of Klamath Lake and came up the Sprague River, probably to Kawumkan Springs. Pertinent parts of Dr. Hubbs' letter follow:

I have just given the material a hurried first glance, and find several species represented.

Level I

The specimens from Level I comprise primarily vertebrae, I guess mostly from suckers (Catostomidae), including some of the modified anterior vertebrae of the Weberian apparatus and one posterior vertebra with hypural. Some of the smaller vertebrae are likely from Cyprinidae (minnows). More promising of identification are seven lower pharyngeals, with teeth. Three of these represent the Catostomidae and four represent the Cyprinidae. Of the latter, one rather surely came from *Gila coerulea* and three presumably came from *Siphateles bicolor*. The latter are unusually large and the teeth are very molar-like, but I think they merely represent bones from old individuals of the assigned species. Both of these minnows are now common in the Klamath System. . . .

Level II

The lot from Level II similarly are mostly vertebrae, some with Weberian and hypural parts, and so forth. There is one fin ray, likely from a sucker. The four sucker pharyngeals in this lot seem to represent two species, which is a bit surprising, as they are not large bones and the large suckers (*Chasmistes*), are little known except as breeding adults. However there are two species that may occur in the streams, the synonymy of which I am just concerned with. All four cyprinidae pharyngeals in this lot are identifiable as *Siphateles bicolor*. . . .

Level III

From Level III I note a series of vertebrae, including Weberian parts, probably representing suckers, and eight lower pharyngeals, of which two represent suckers, five *Siphateles,* and one *Gila*. This lot contains the posterior tip of the maxillary of a salmonid, with rather large teeth. This is your specimen number 20-800.

Level IV

Lot number IV contains, in addition to the usual run of vertebrae, one lower pharyngeal each of a sucker and of *Gila,* and six of the *Siphateles*. Included also are one maxillary and one vomer of the family Salmonidae. The mandible is number 20-820 and the vomer is 20-624.

The two mandibles very likely represent trout. They seem to be more compressed, more delicate, and more curved than the maxillary on a King Salmon at hand that measures 376 mm. in standard length. I will have to compare these jaw bones with specimens of several species, to feel at all sure. They are hardly of the size that would be expected of a mature salmon, though they might represent a grilse. The vomer, in contrast, is several times as heavy and coarse, particularly in the teeth, than in the 376 mm. King Salmon at hand. From this I judge that the vomer came from a fish well over three feet in length, and likely about four or five feet long. It is therefore highly probable that the vomer came from a King Salmon. Again, however, I would like to compare specimens before considering the decision at all final.

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FIG. 38. Klamath habitat. (1) Northwest over Klamath habitat around Sprague River. Klamath Marsh upper center, Cascade Range at skyline. (2) East from over site. Saddle Mountain upper left. (3) Generally west over Kawumkan Springs, center with Sprague River in curve lower left. (4) Typical meander pattern of Sprague River in meadows. (5) Typical meadow, prairie and forest of Klamath habitat. Terrace with pines in center was a contact village site. KL-11 on upstream side. River comes out canyon right center. (6) Confluence of Sprague and Williamson rivers. Sprague River-IV on top of white bluff. Old U. S. 97 lower part of picture. Chiloquin shows left center.

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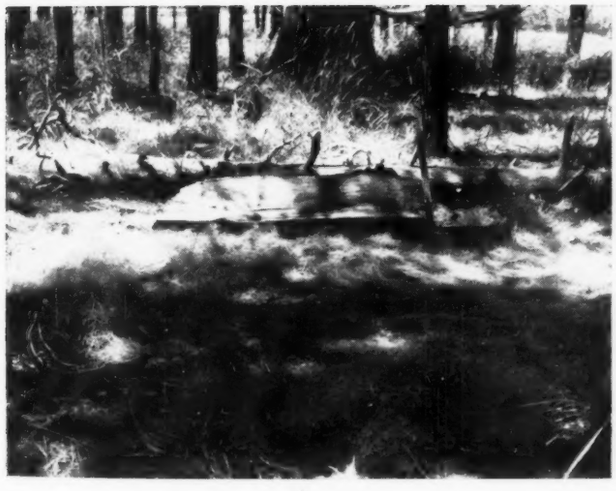

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FIG. 39. Trees showing scars of bark removal; power quest stone pile. (1) Scar on tree where bark was removed for food. McCready Ranch. (2) Scar on tree as in 1. Other trees in grove bear scars. (3) Large "plank" split in storm suggests planks used in house KL-9, *cf.* fig. 31. (4) One of many "Power Quest" cairns on McCready Ranch.

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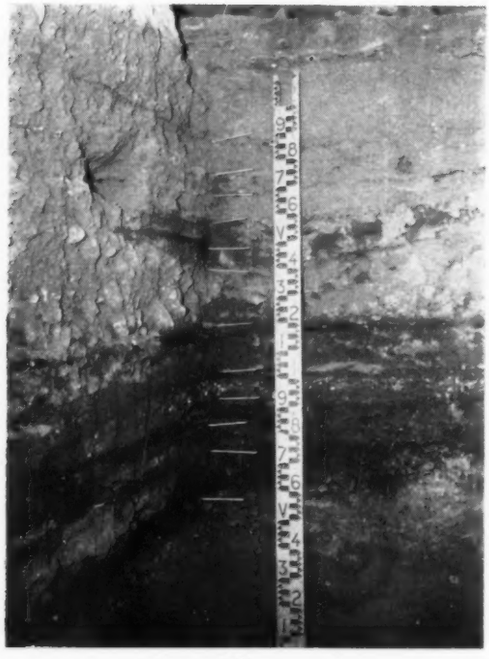

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FIG. 40. Medicine Rock Cave. (1) Sprague River riffles in front of Medicine Rock Cave. Favorite fishing place. (2) Medicine Rock Cave around shoulder of cliff. Notice successive lava flows. (3) Occupation levels in Medicine Rock Cave indicated by stakes. Lowest not shown. Rod is 2 m. long. (4) Portion of child's cranium in fire lens in Medicine Rock Cave.

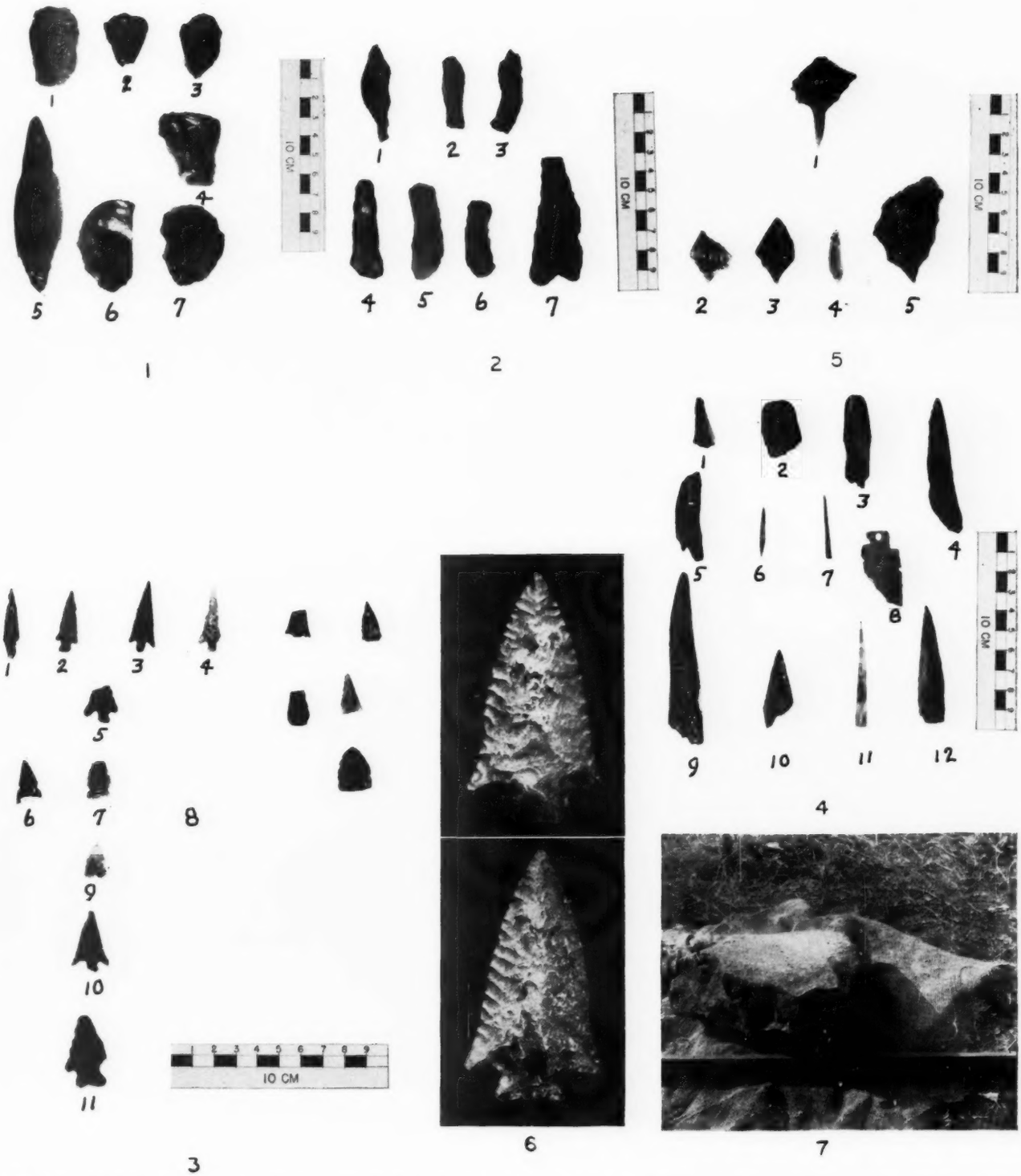


FIG. 41. Medicine Rock Cave artifacts. (1) Knife and scrapers above pumice. (2) Long flake scrapers—above pumice. (3) Projectile points and fragments—above pumice. (4) Bone and wood artifacts—above pumice. (5) Drills and finger perforators or gouges—above pumice. (6) Basalt atlatl point from under pumice: opposite sides; length 77 mm., across barbs 42 mm. (7) Metate from above pumice. Compare with fig. 49.

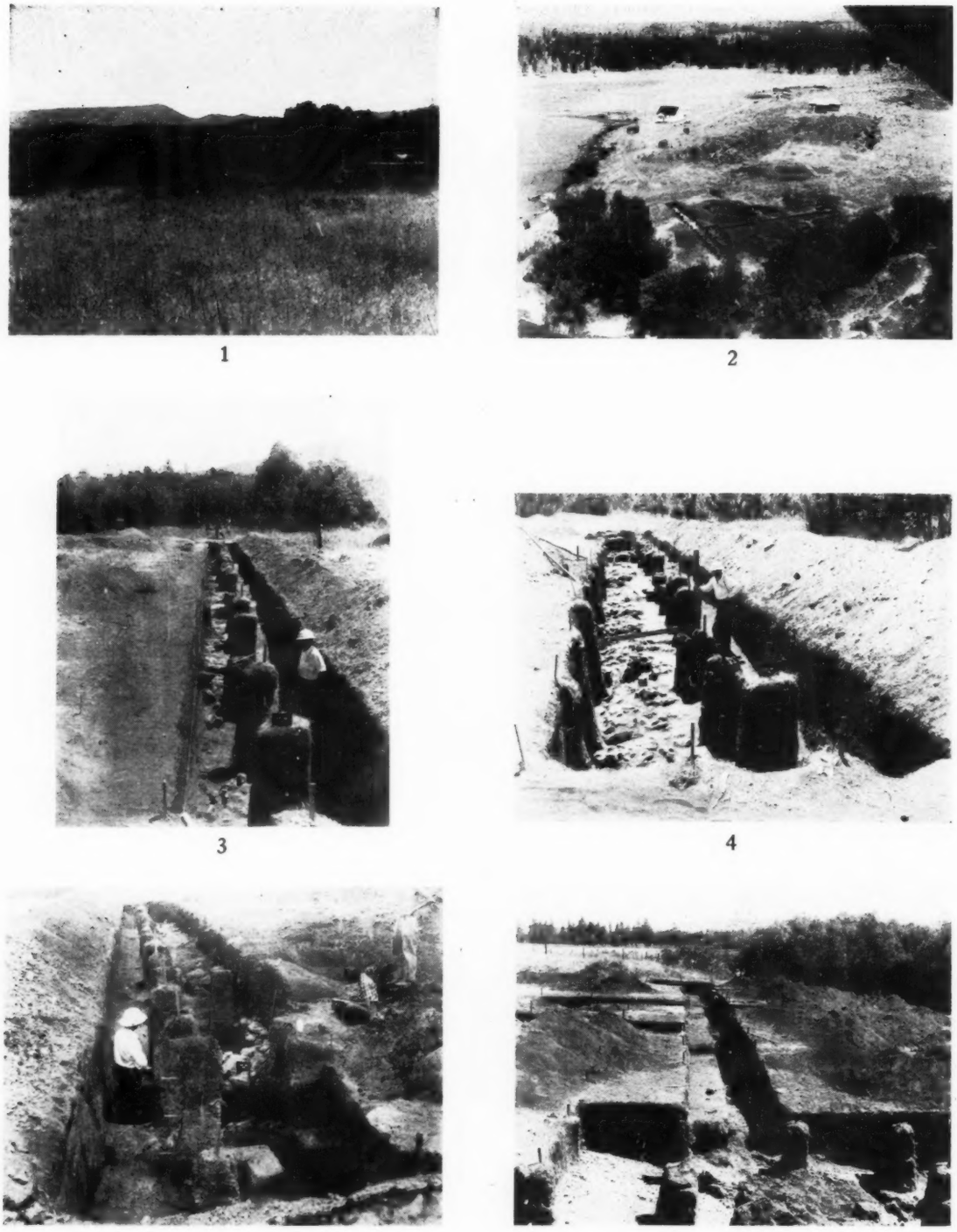
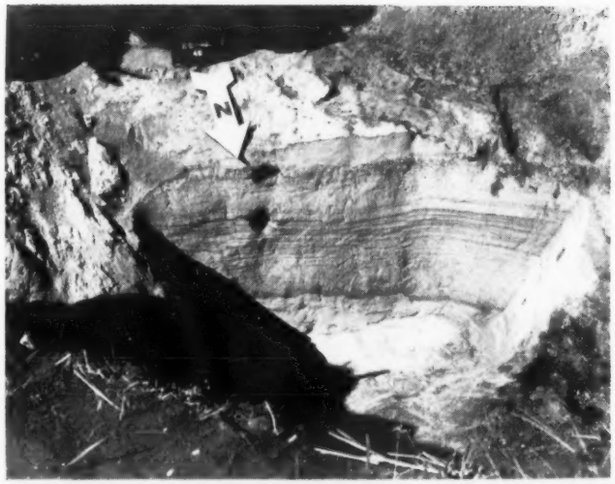


FIG. 42. Kawumkan Springs Midden and trenches. (1) Midden site before excavation. (2) Midden from air at end of excavation, dark depressions are house pits. (3) From 2X/0Y toward 40X/0Y; exploratory trench outside of pillars 0-1Y on left. (4) 0-2Y trench from 2X to 40X showing floor, sections of stadia rod are 2 m. long. (5) 0-2Y trench from 40X showing "kitchens." (6) Trench 22-24X from 5-32Y, narrowed to 1 m. 23-24 after 40 cm. in depth.



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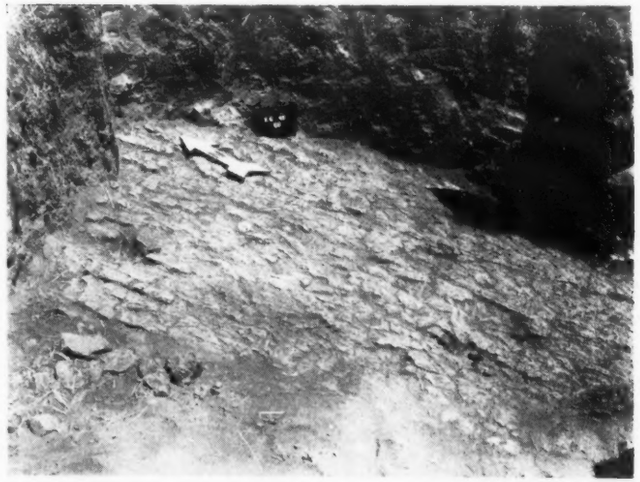

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FIG. 43. Kawumkan Springs Midden: sub-midden surface. (1) Fine volcanic ash, air laid and water laid pumice and diatomaceous deposits underlying midden. Black spots are rodent holes. (2) Sandstone and diatomite under midden 20–22X/3–5Y. (3) Sandstone and diatomite under midden, 22–24X/3–5Y. (4) Diatomite under midden 24–26X/3–5Y, "kitchen" at left.

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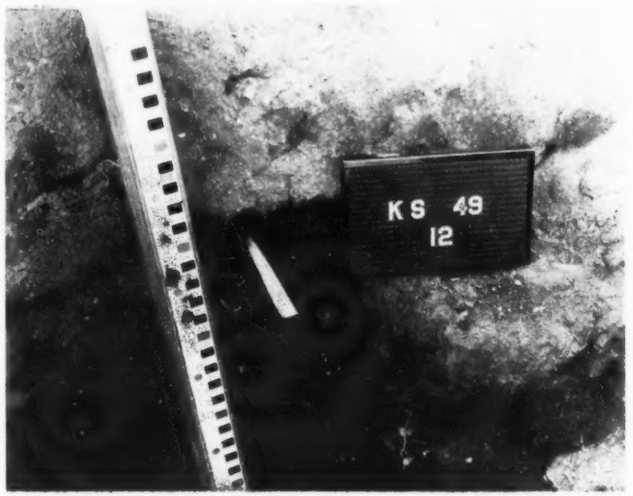

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FIG. 44. Kawumkan Springs Midden: artifacts *in situ*. (1) 2 manos and broken metate. (2) Cache of hotrocks. (3) Fragment of bone knife in trench wall, 7.3X/1.0Y. (4) Trench wall between 38–40X/1–2Y showing compact character of fill and artifacts *in situ*, Long-IV floor forms top of center block.

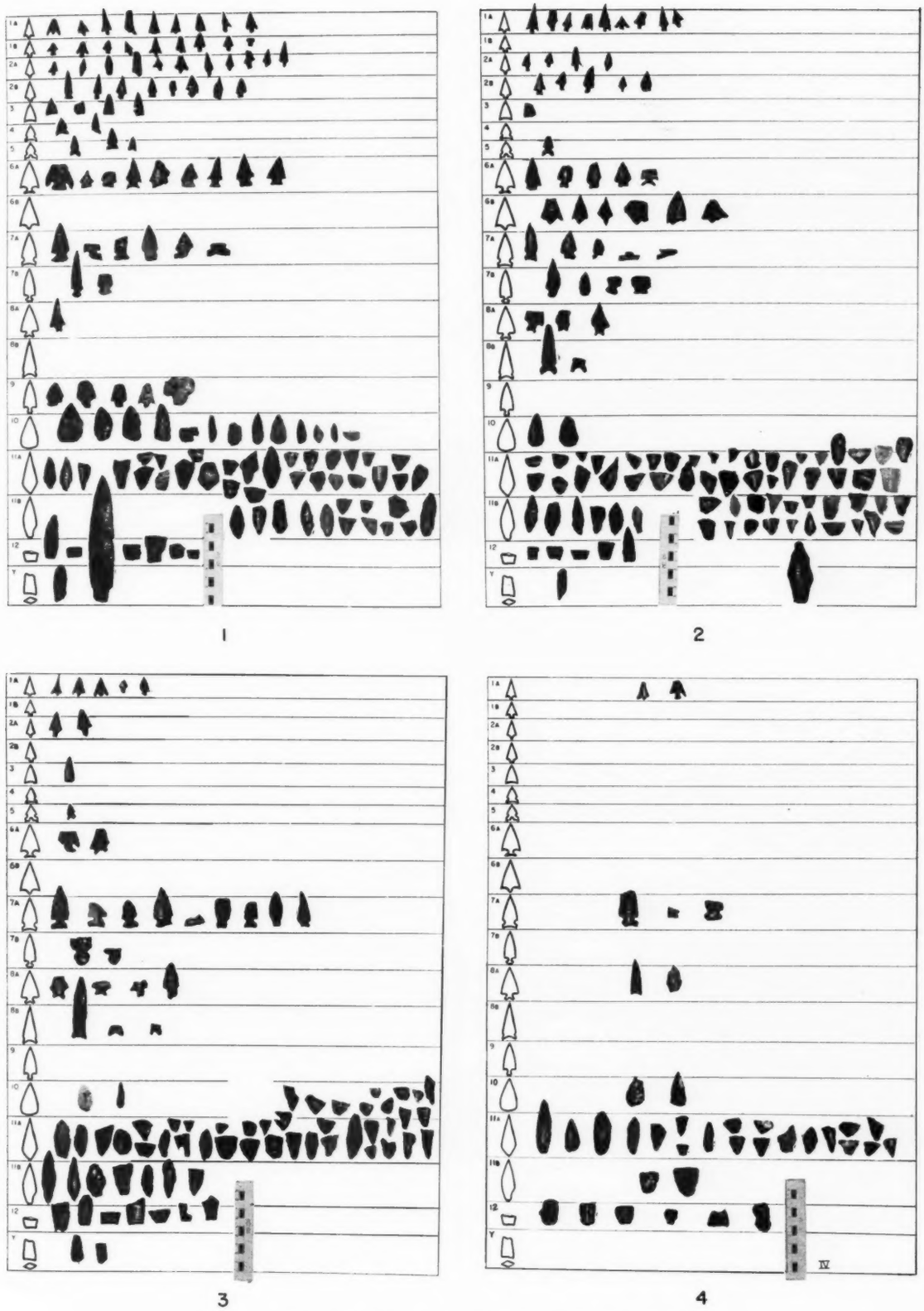


FIG. 45. Projectile points by Levels, Kawumkan Springs Midden.
(1) Level I. (2) Level II. (3) Level III. (4) Level IV.

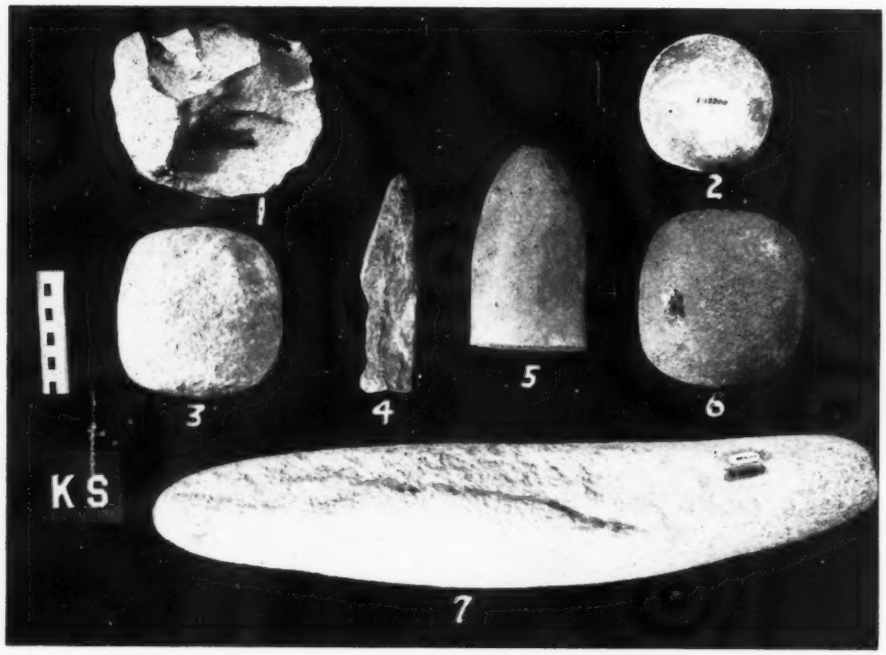


FIG. 46. Selected heavy tools, Kawumkan Springs Midden. (1) Chopper. (2, 3, 6) Mauls. (4) Wedge. (5) Pestle fragment. (7) Combination grinding and hammering tool.

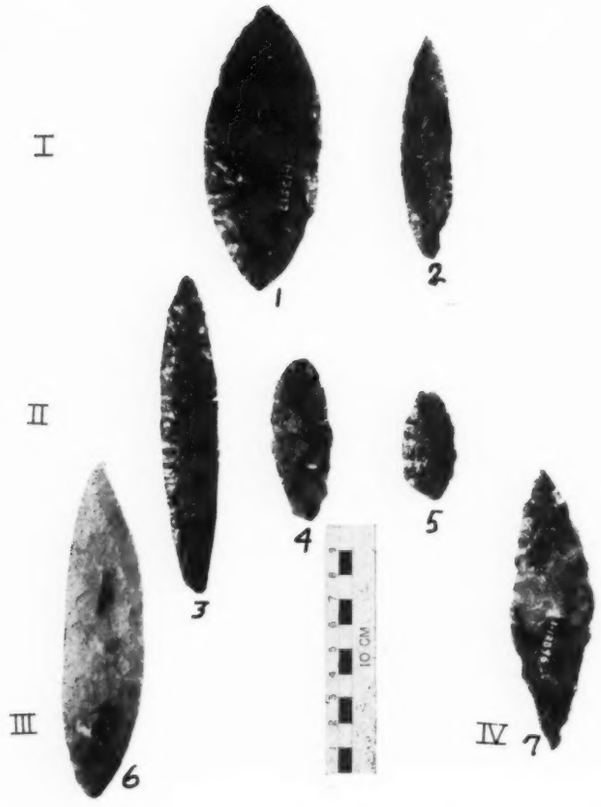


FIG. 47. Knives by Levels, Kawumkan Springs Midden. No. 1–12896 not from midden but can be equated with Level IV (see text p. 418). Level I right specimen has broken base.

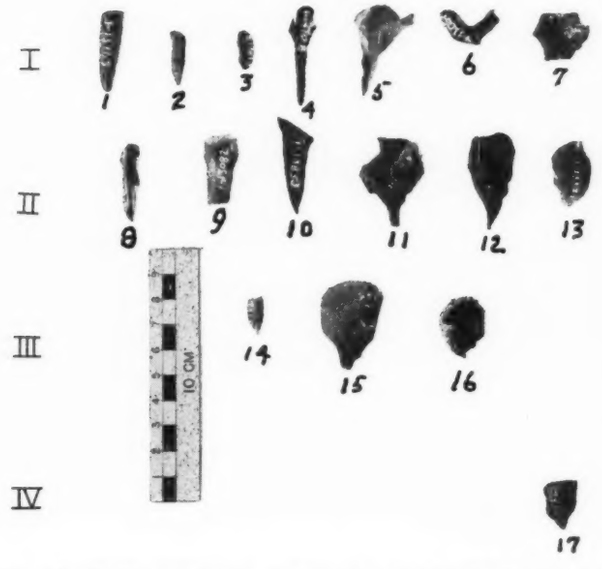
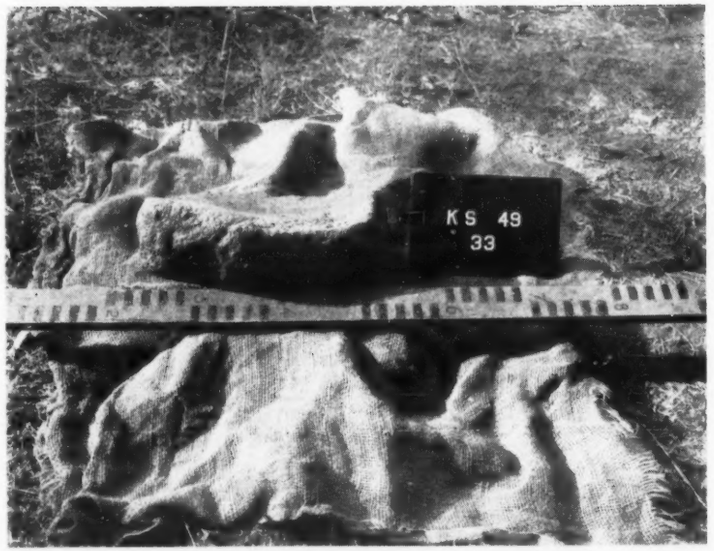


FIG. 48. Drills, perforators and gravers by Levels, Kawumkan Springs Midden. Referred to by numbers in text.



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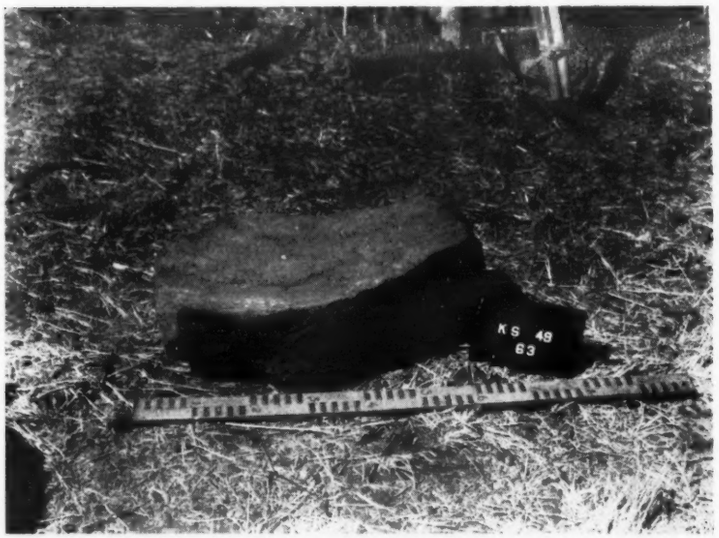

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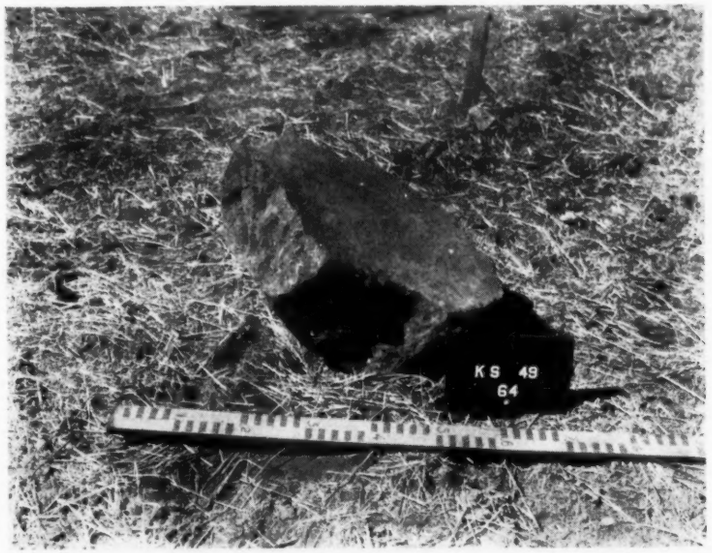

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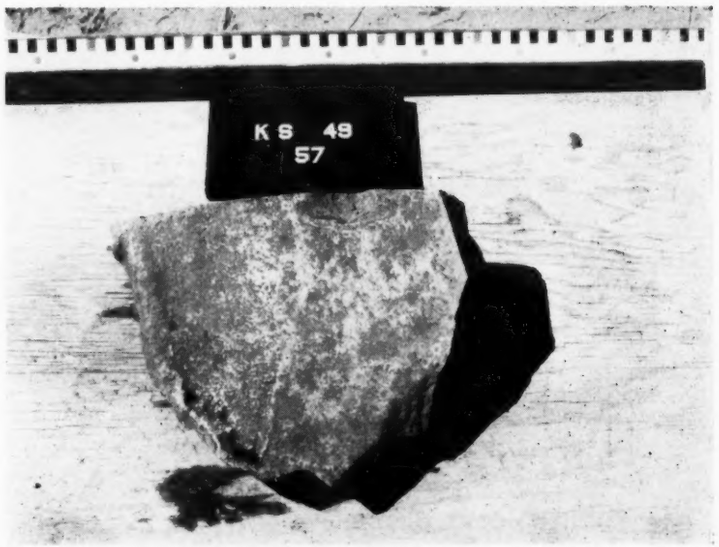

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FIG. 49. Metates, Kawumkan Springs Midden. (1) Metates from "kitchen." Scale is 1 m. rod. (2) Metate found at 23.6X/24Y (center meas.), elev. 97.39 (top). (3) Metate found close to No. 2. (4) Paint metate encrusted with red paint, in Level I, 22–24X/5–6Y.

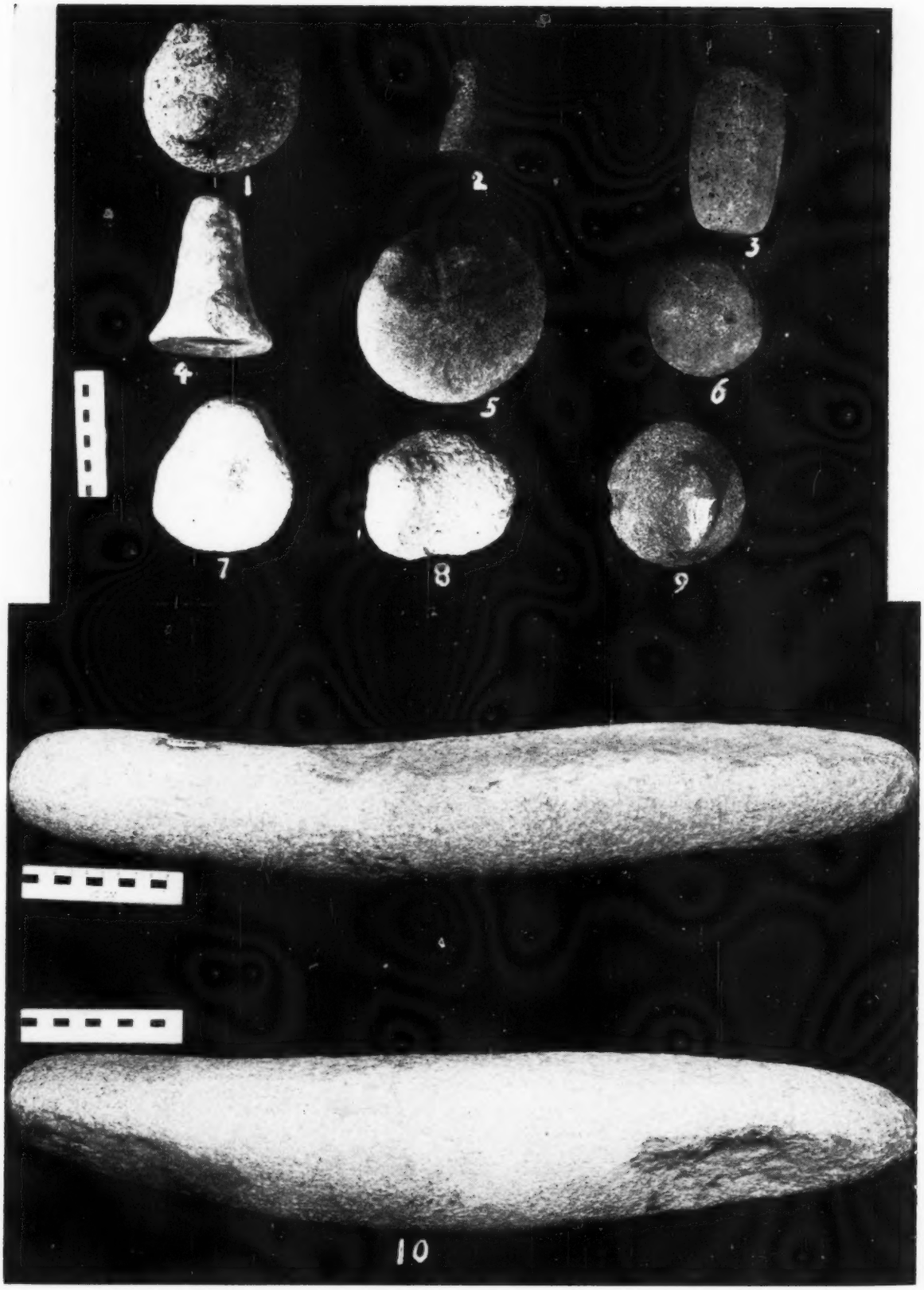

FIG. 50. Manos (and large midden specimen), from Kawumkan Springs Midden, house pits and later village sites. (10) Combination grinding and hammering stone from "kitchen" with lower picture turned to show finger grips at each end.

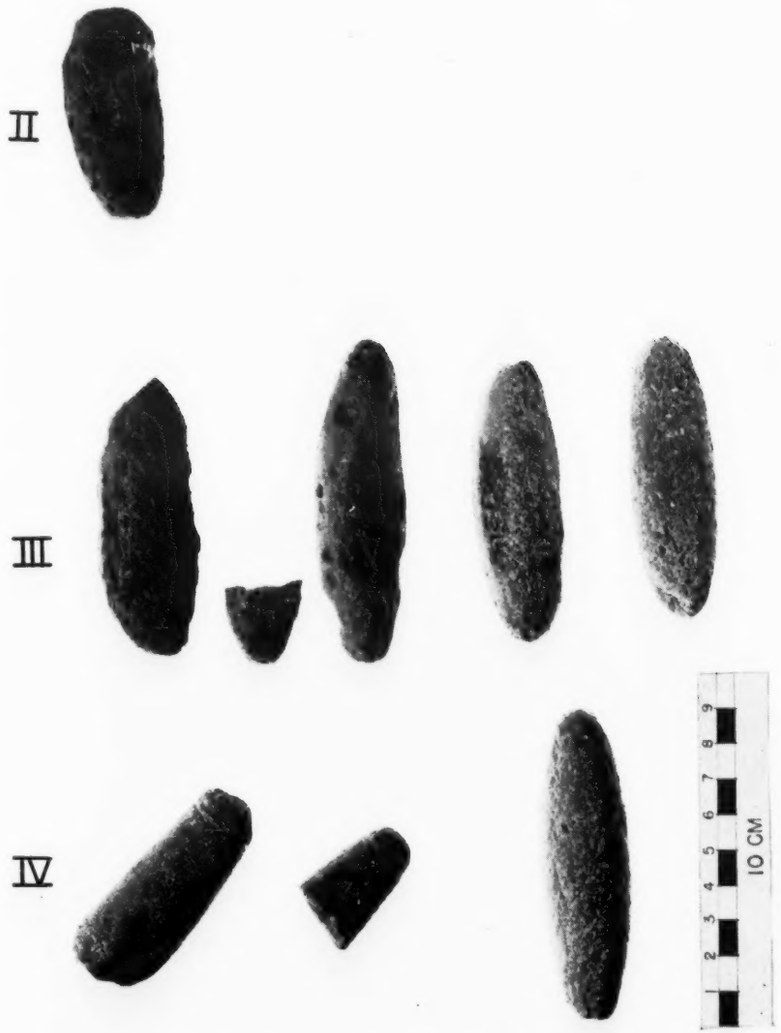

FIG. 51. Small pestle like stones (atlatl weights?) by Levels, Kawumkan Springs Midden. Right two in Level III seem to have end grooves. Left two in Level IV sloped to pick up groove in photo.

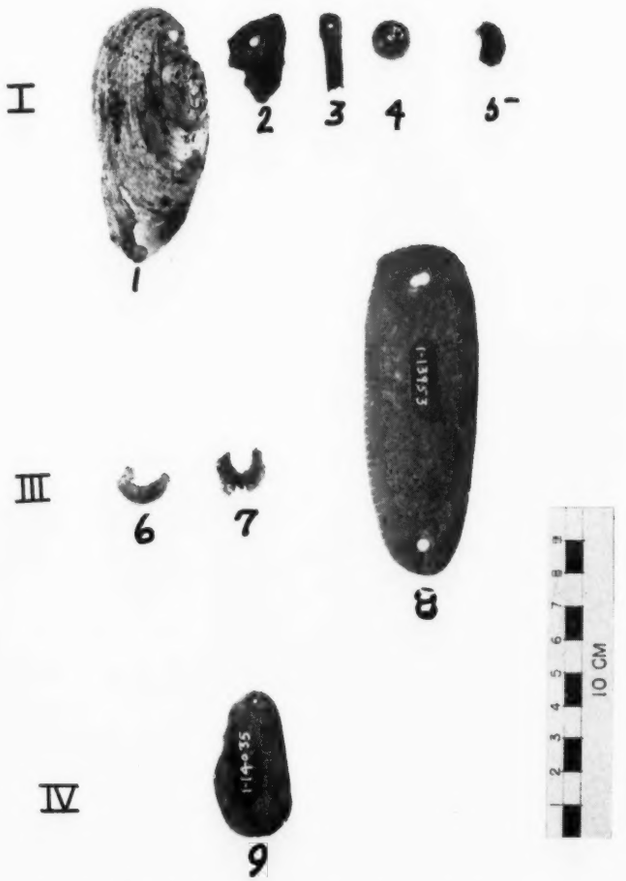

FIG. 52. Pendants by Levels, Kawumkan Springs Midden. Referred to by numbers in text.

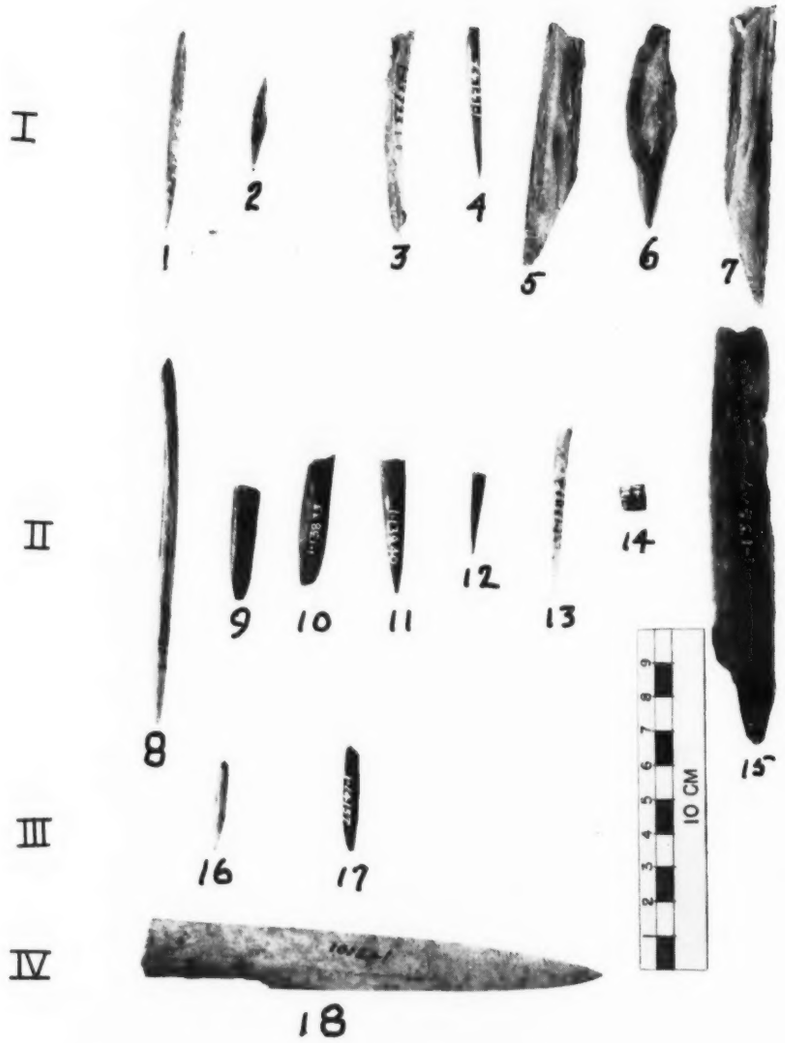

FIG. 53. Bone artifacts by Levels, Kawumkan Springs Midden. Referred to by numbers in text.

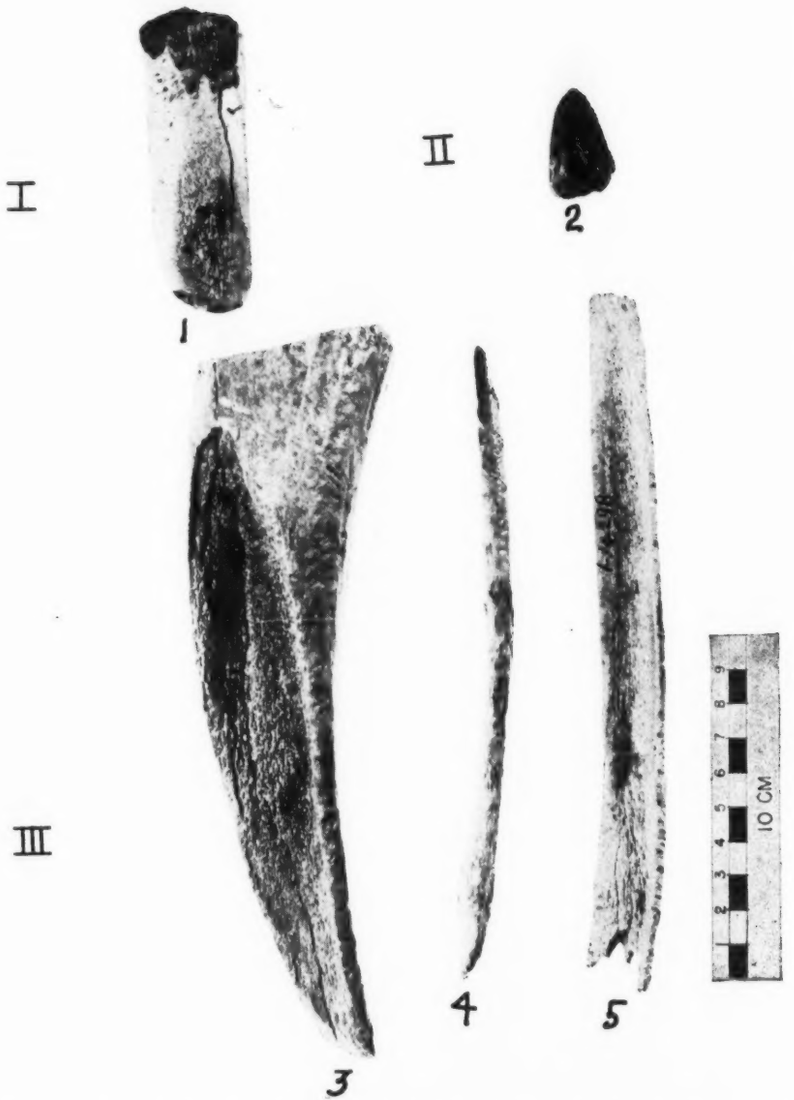

FIG. 54. Bone (other than in fig. 53) and antler artifacts by Levels, Kawumkan Springs Midden. Bone and antler artifacts—Kawumkan Springs Midden—(1, 2) Elk horn wedge fragments. (3) Elk horn flesher. (4) Bevelled bone projectile point in skeleton 11–222. (5) Flesher; (3) and (5) in "kitchen" into which 11–222 had been buried.

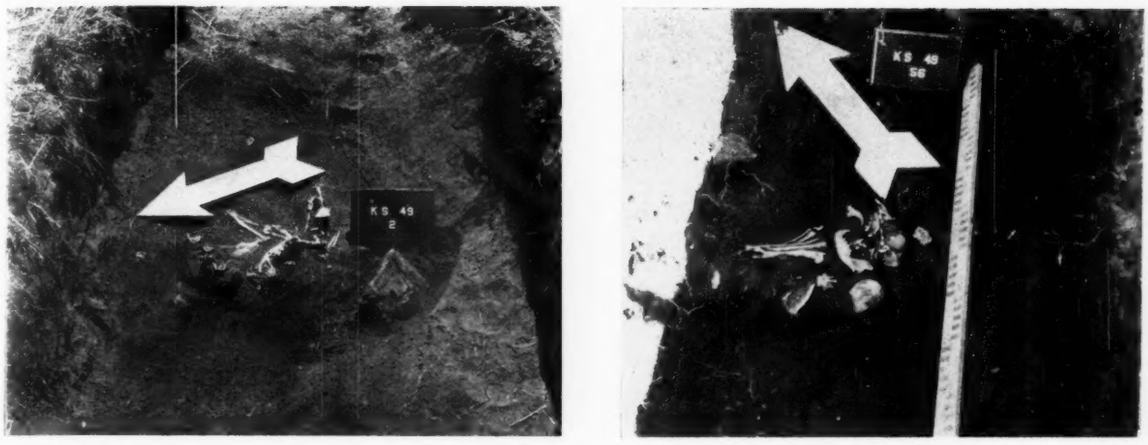

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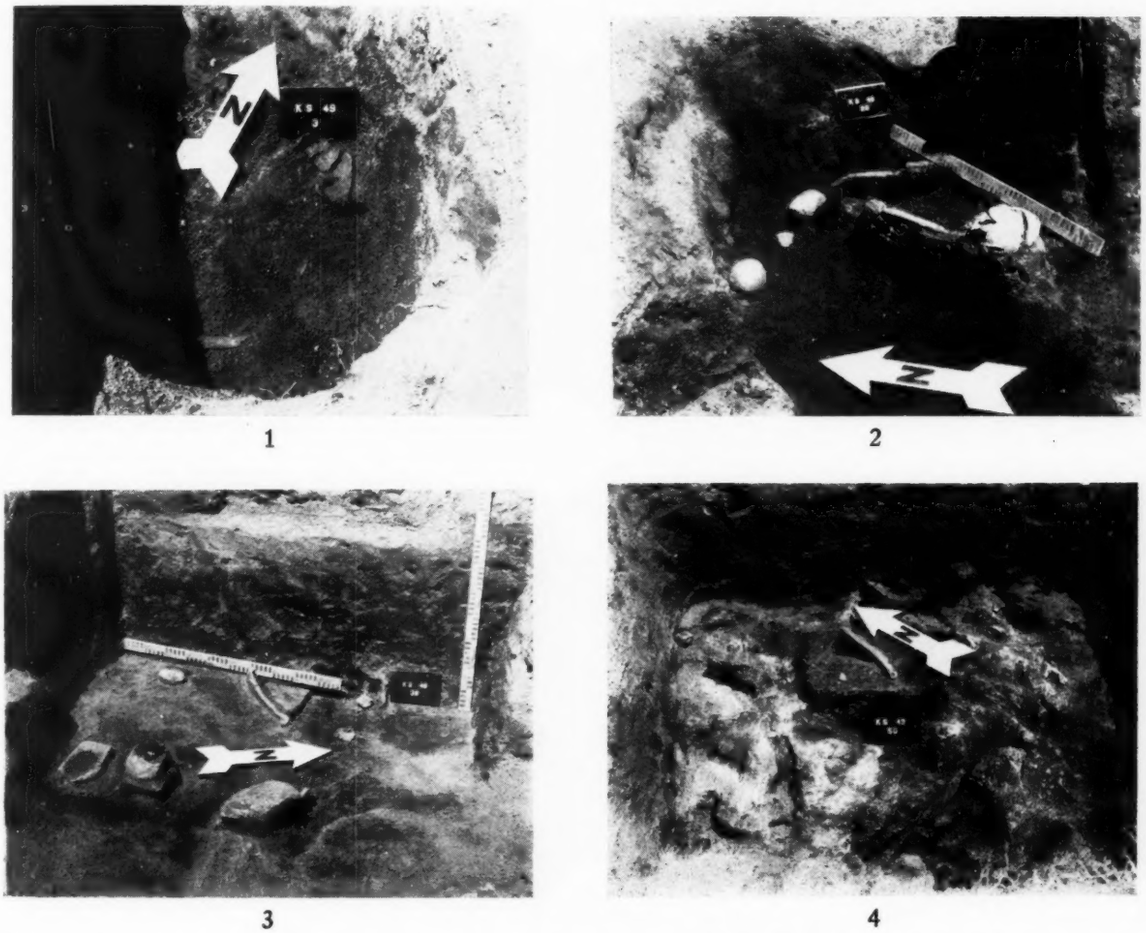
FIG. 55. Dog skeletons *in situ*, Kawumkan Springs Midden. (1) Dog skeleton in exploratory trench. (2) Dog skeleton, 20–18, with broken femur. Projectile point not thought to be associated.



1 2 3 4

FIG. 56. Human skeletal remains *in situ*, Kawumkan Springs Midden. (1) Skull cap of skeleton in exploratory trench; on sandstone, No. 11–220. (2) Burial of 11–221; mauls and flake chopper probably not associated. (3) Femur and portion of cranium. (4) Femur badly gnawed—resting on sandstone.

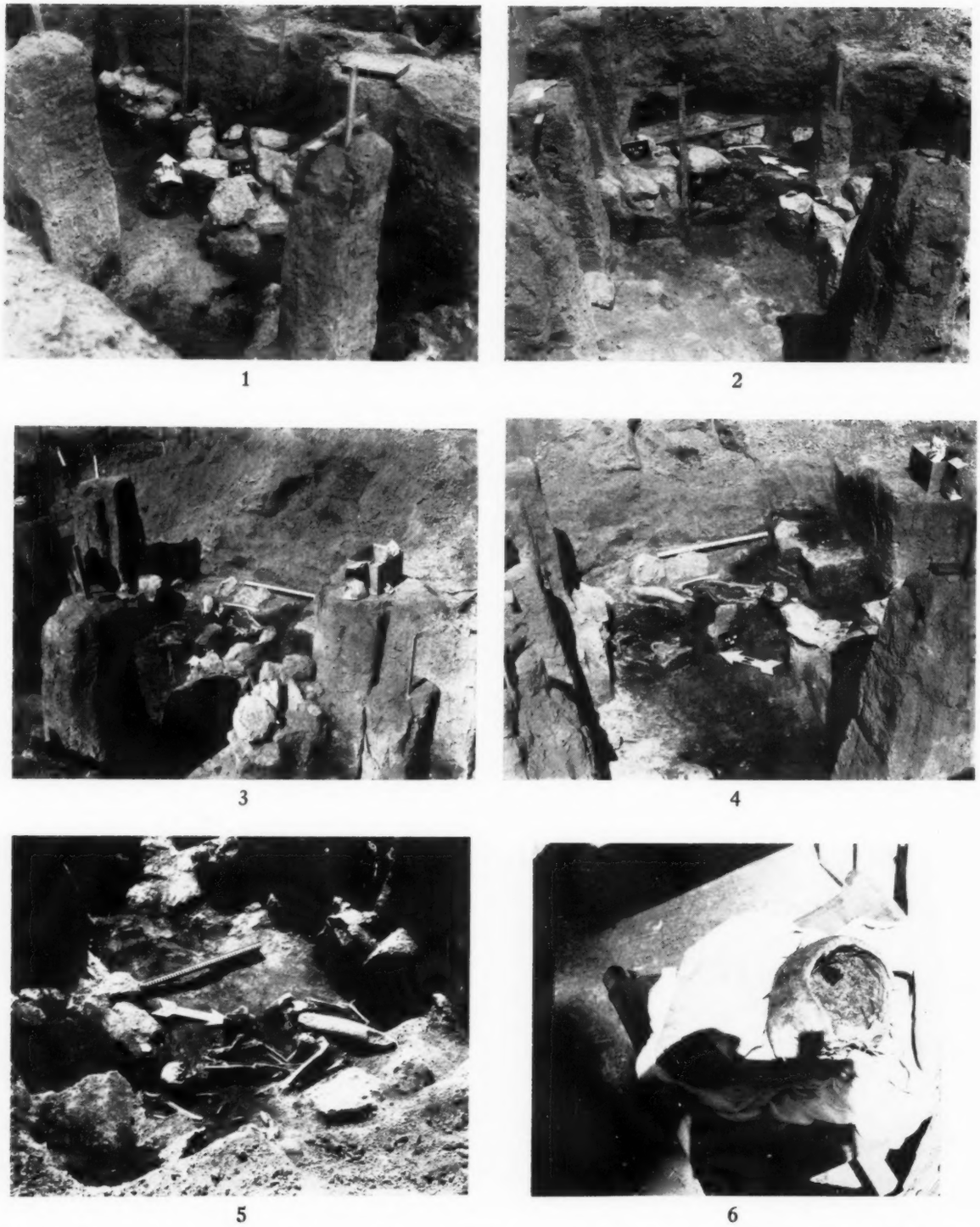
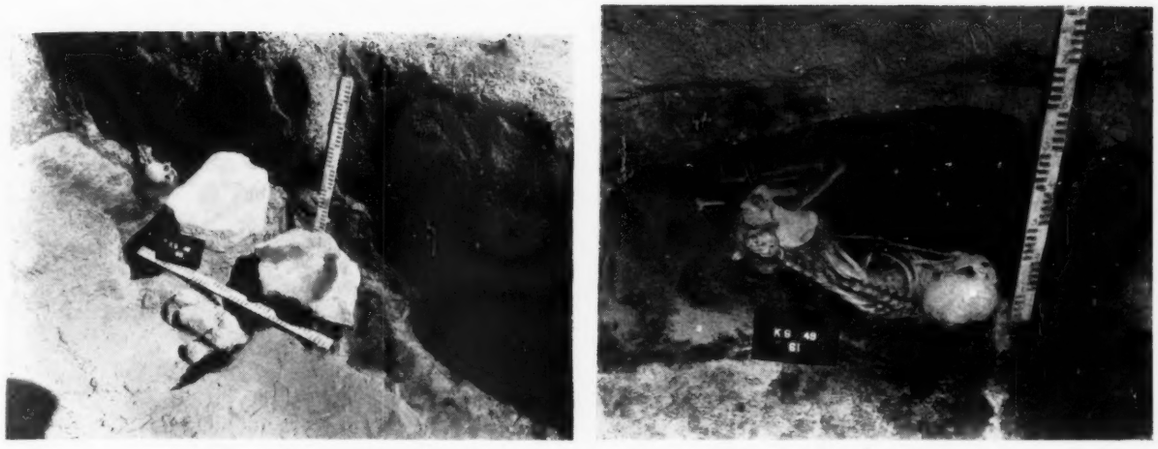
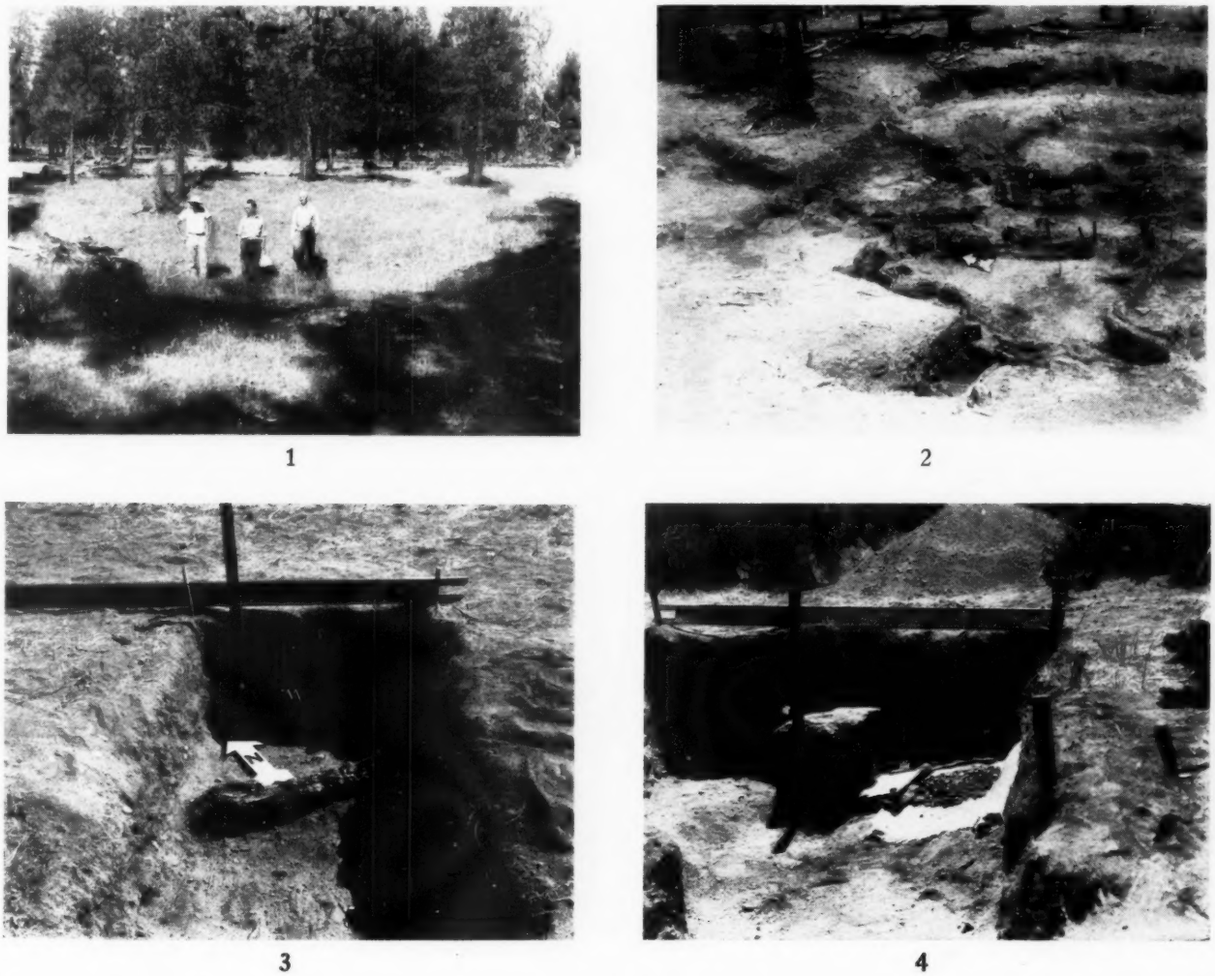


FIG. 57. Burial, skeleton 11–222, Kawumkan Springs Midden. (1) "Kitchen" extending across trench and into face. (2) "Kitchen" partly removed and overburden excavated. Adolescent crania at base of meter rod; femur of 11–222 exposed. Lower crania 40 cm. below "kitchen" level. (3) "Kitchen" partly removed and burials further exposed. (4) Mandible of upper cranium over frontal bone of lower. (5) Complete exposure showing "kitchen" stones and artifacts. Bone projectile point between lower bones of right arm and left femur. (6) Projectile in left occipital portion of cranium, 11–222.



1 2

FIG. 58. Burial, skeleton 11–236, Kawumkan Springs Midden. (1) Skeleton 11–236 and large metates in trench near by. Nearer metate was overturned. (2) Skeleton 11–236 *in situ*. Flashlight photo.



1 2 3 4

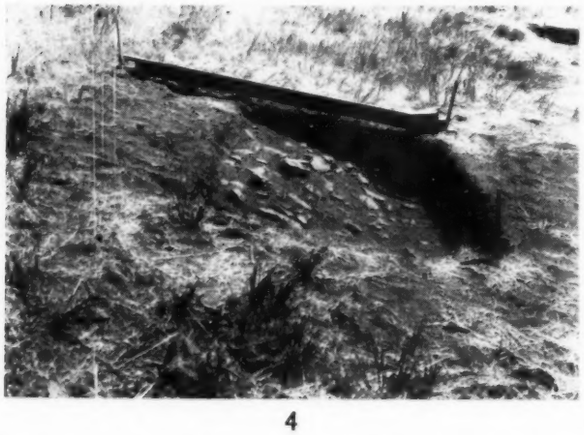
FIG. 59. House pits KL-9, KL-10. (1) KL-9. July 1949. Stump of tree in left center. (2) KL-9. July 1951. Near completion of excavation. Stakes outline and protect timbers. (3) KL-10. Trench showing burnt house timber. (4) KL-10. End of trench in midden surrounding house pit showing ice-rafted rock and gravels.

1

2

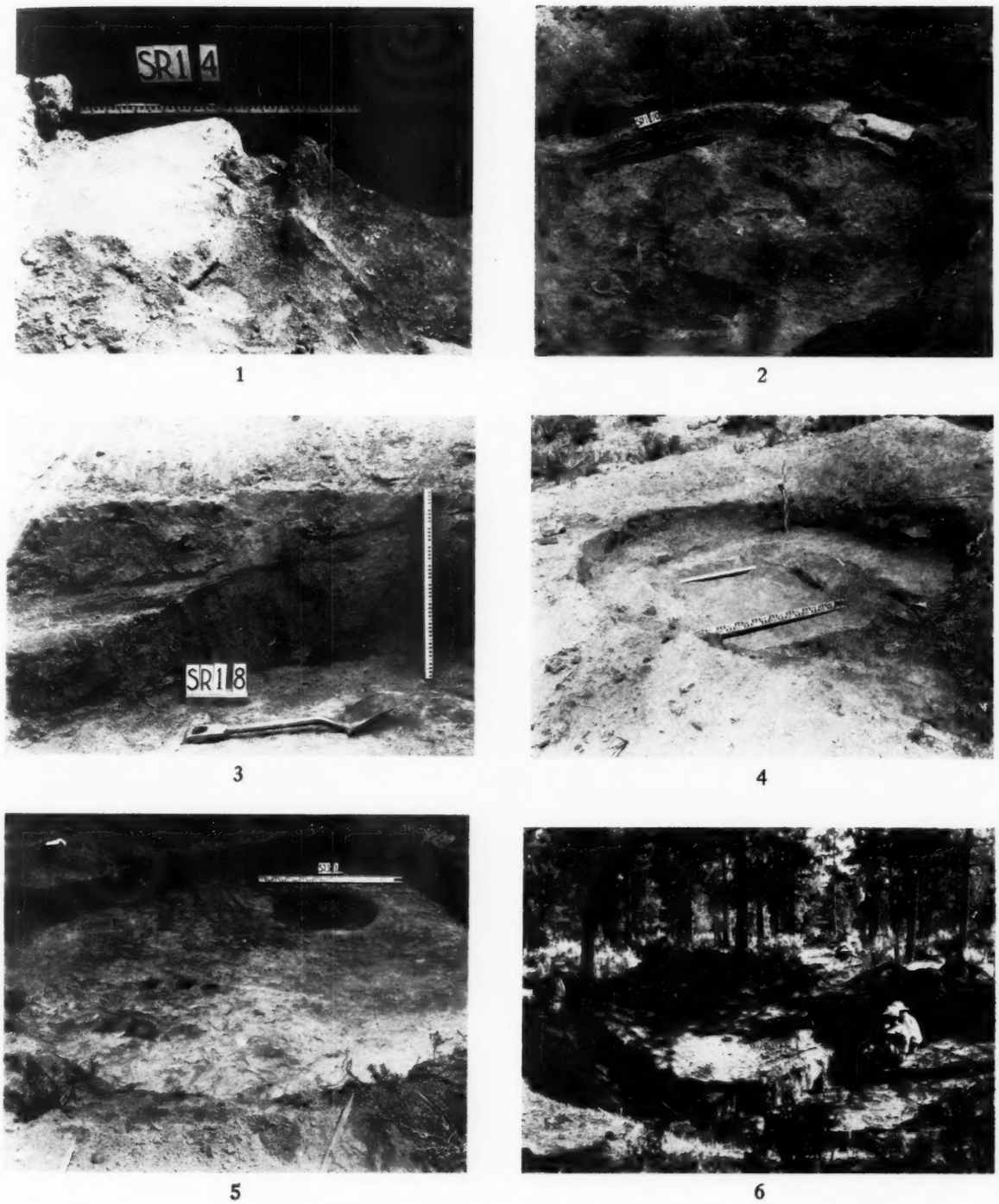
3

5



4

FIG. 60. House pits KL-11, KL-12. (1) East side of terrace at KL-11. Site in rear of photographer's position. Sprague River just out of picture on left. (2) Side of terrace opposite point where No. 1 was taken. Sprague River to left. View is opposite to direction in No. 1. (3) KL-11. Midden from village on top of terrace between locations of Nos. 1 and 2. (4) Excavation near top of midden slope of KL-11 showing shallow deposit over river laid gravel. (5) KL-12. Rod is 4 m. long and is in bottom of the house pit.



1 2 3 4 5 6

FIG. 61. House pits on Sprague and Williamson rivers. (1) Sprague River-I showing bench and outer edge of roof pulled in by collapse. (2) Sprague River-I. Completed excavation with fire pit in lower left; meaning of break in bench at upper right unknown. (3) Sprague River-I showing in face back of rod and near top, the slope of a floor of an earlier pit through which SR-I had been dug. (4) Sprague River-II showing side entrance at end back of meter rod. Other rod is 2 m. long. (5) Sprague River-III showing storage pit and possibly post holes for roof support. (6) Merritt-I.

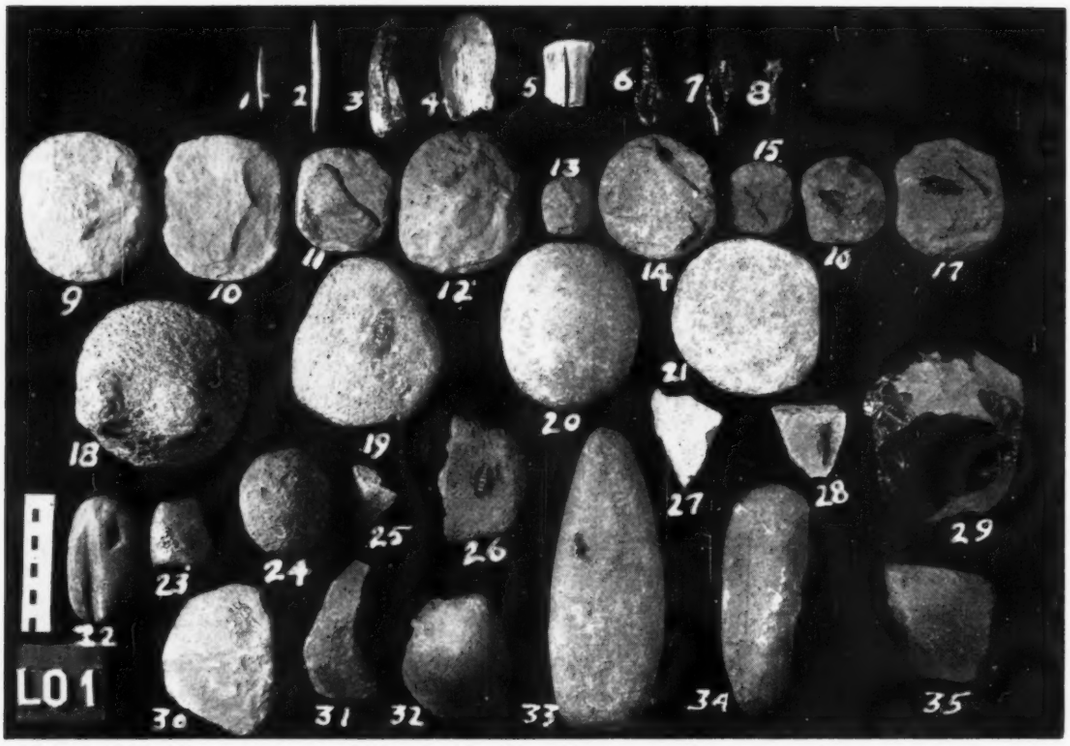


FIG. 62. House pit artifacts from Long-I. Referred to by numbers in text.

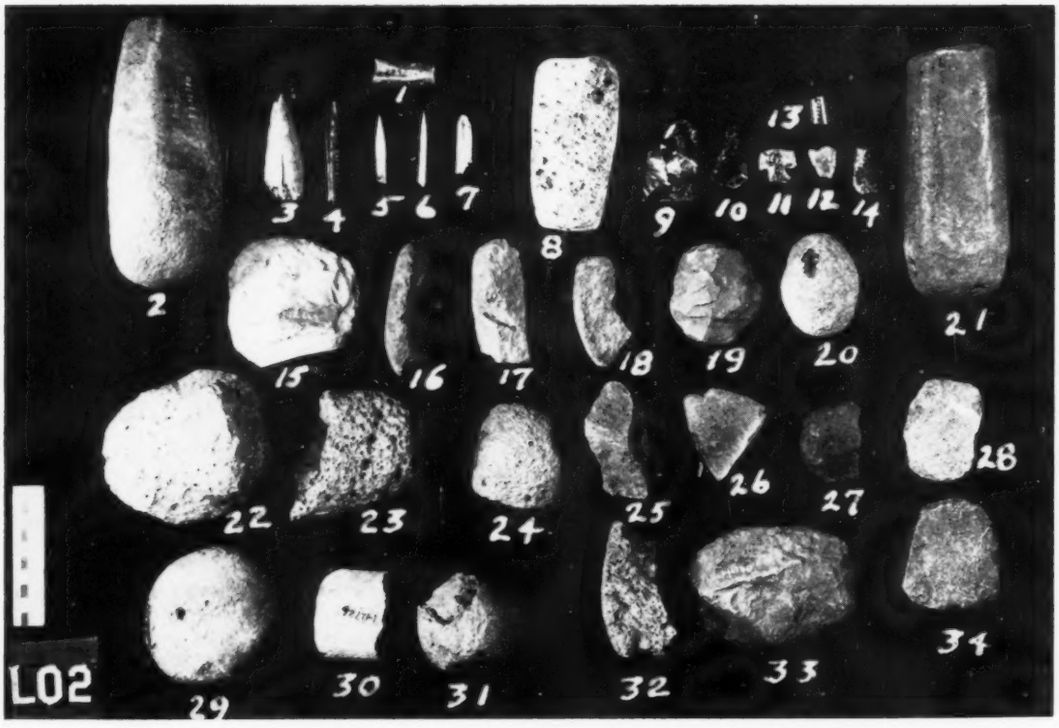


FIG. 63. House pit artifacts from Long-II. Referred to by numbers in text.

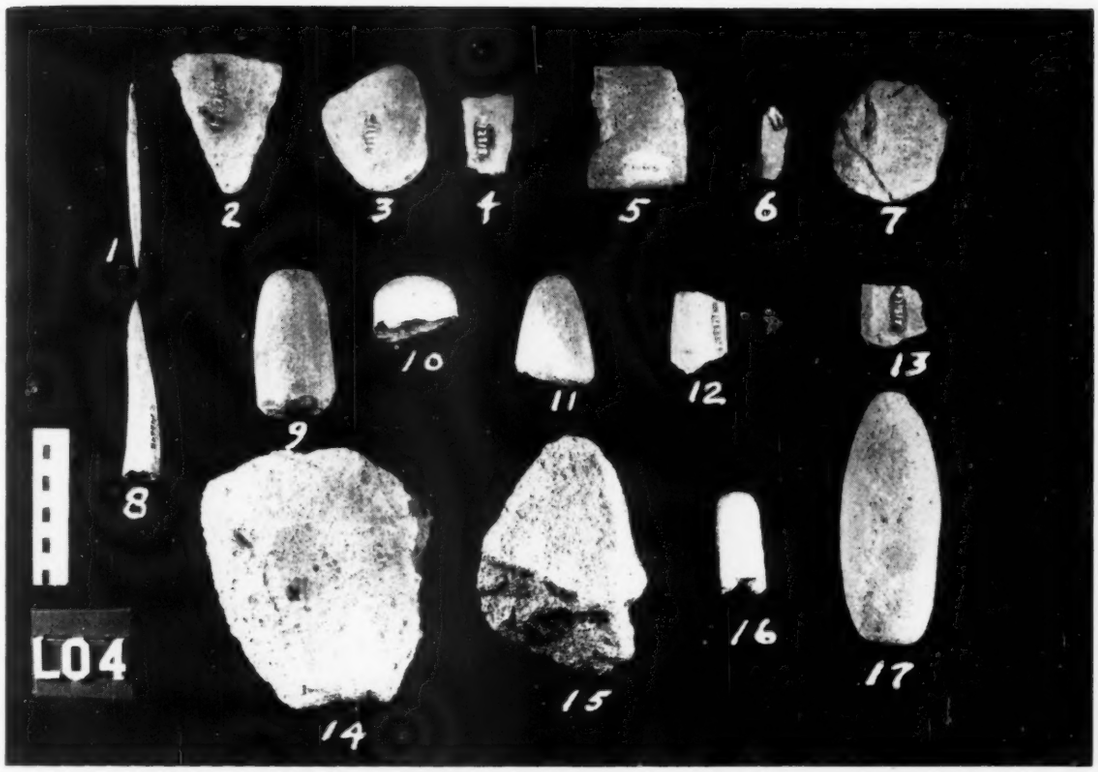


FIG. 64. House pit artifacts from Long-IV. Referred to by numbers in text.

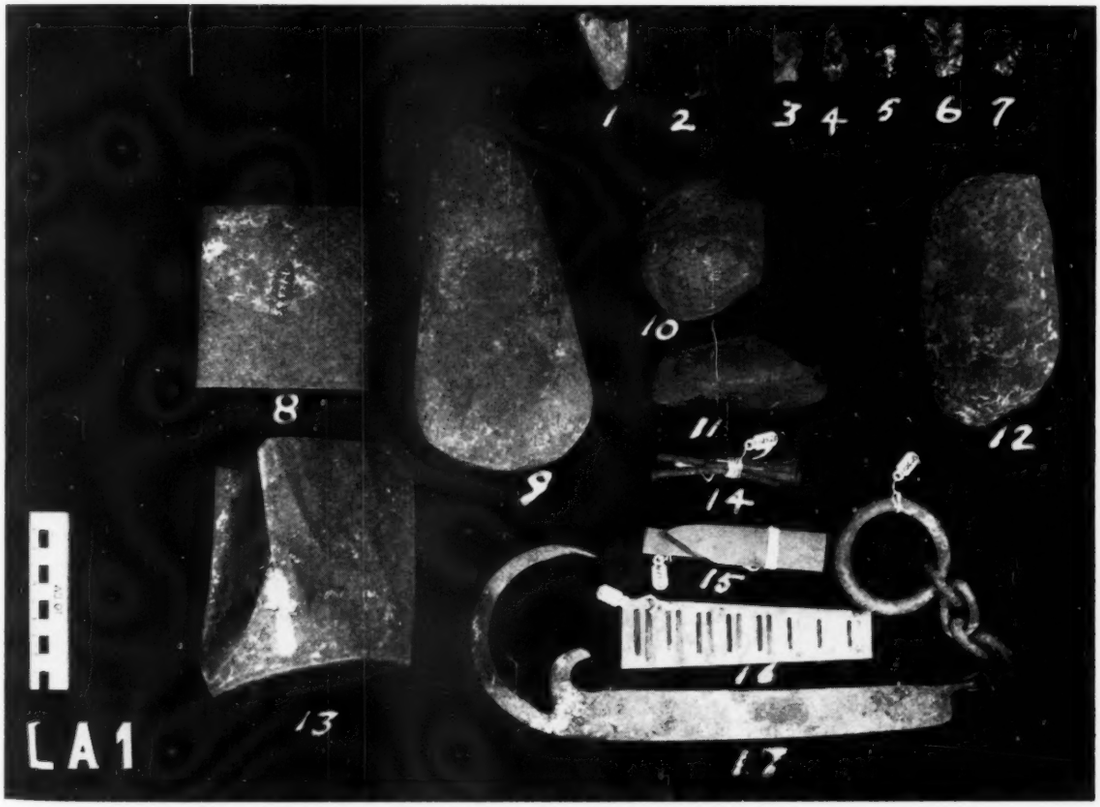


FIG. 65. House pit artifacts from Lalo-I. Referred to by numbers in text.

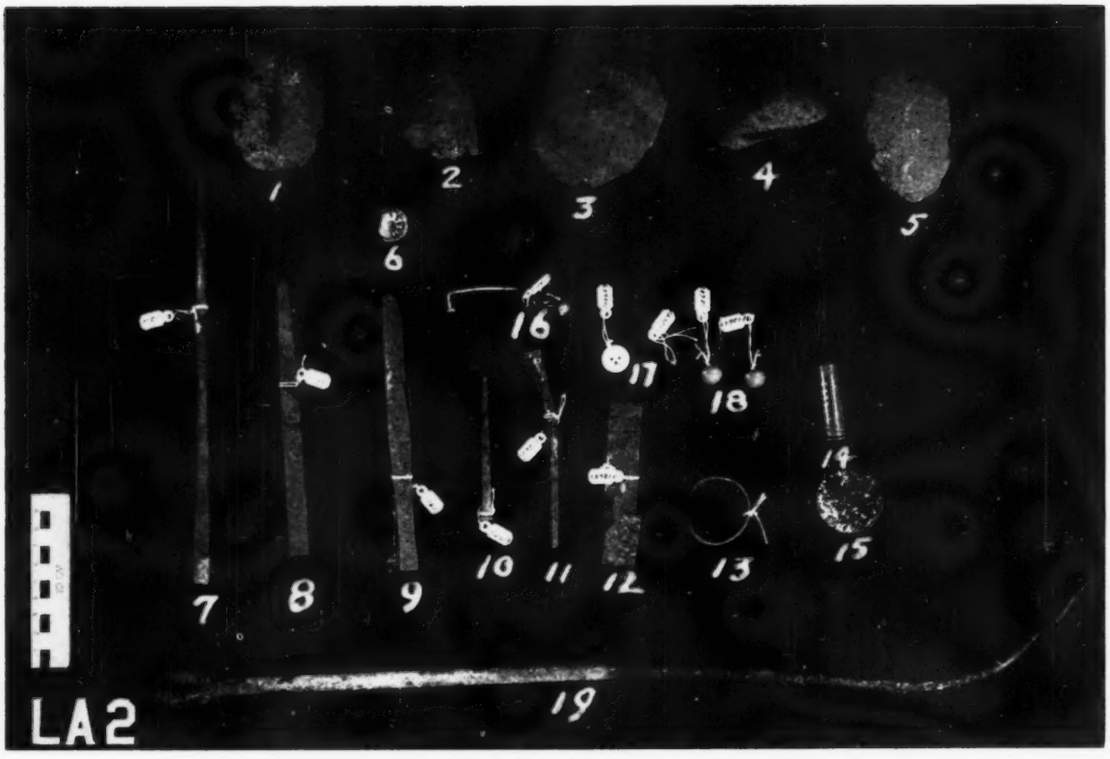


FIG. 66. House pit artifacts from Lalo-II. Referred to by numbers in text.

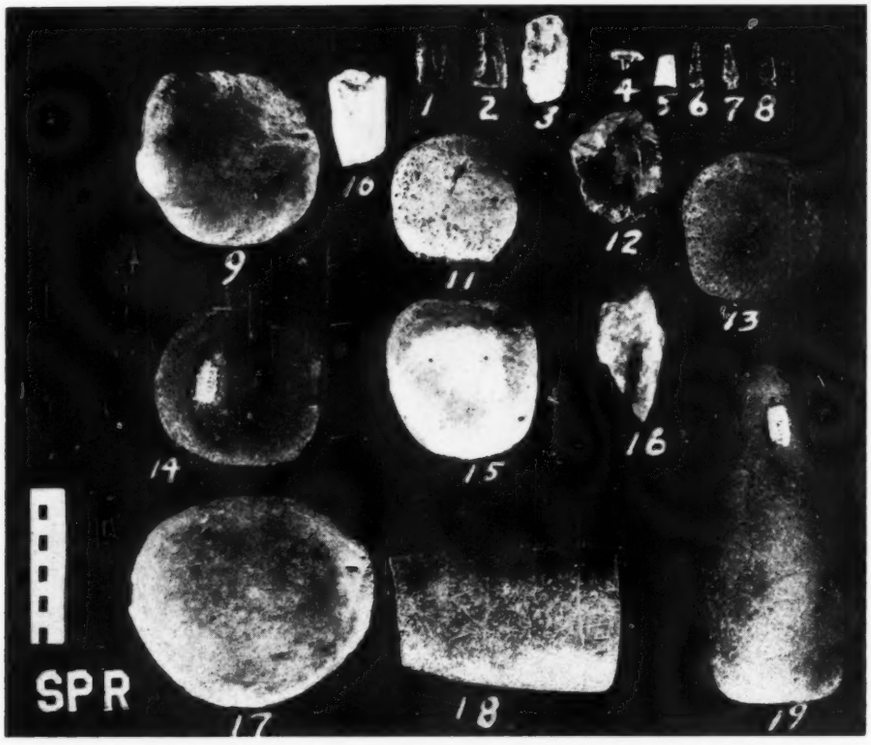


FIG. 67. House pit artifacts from Sprague River-I–IV. Referred to by numbers in text.

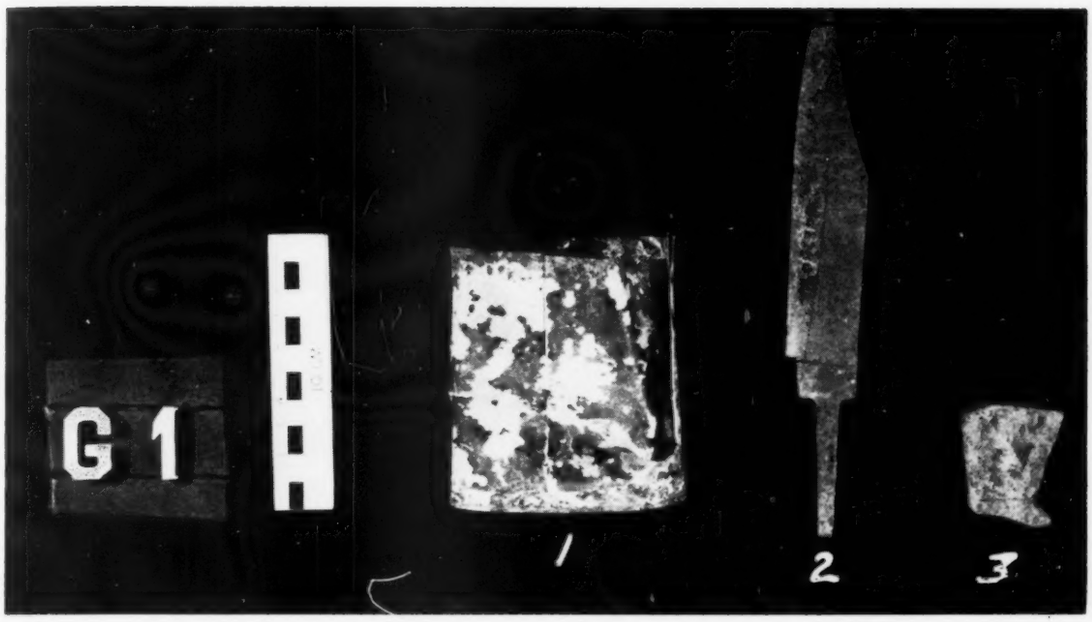


FIG. 68. House pit artifacts from Gentry-I. Referred to by numbers in text.

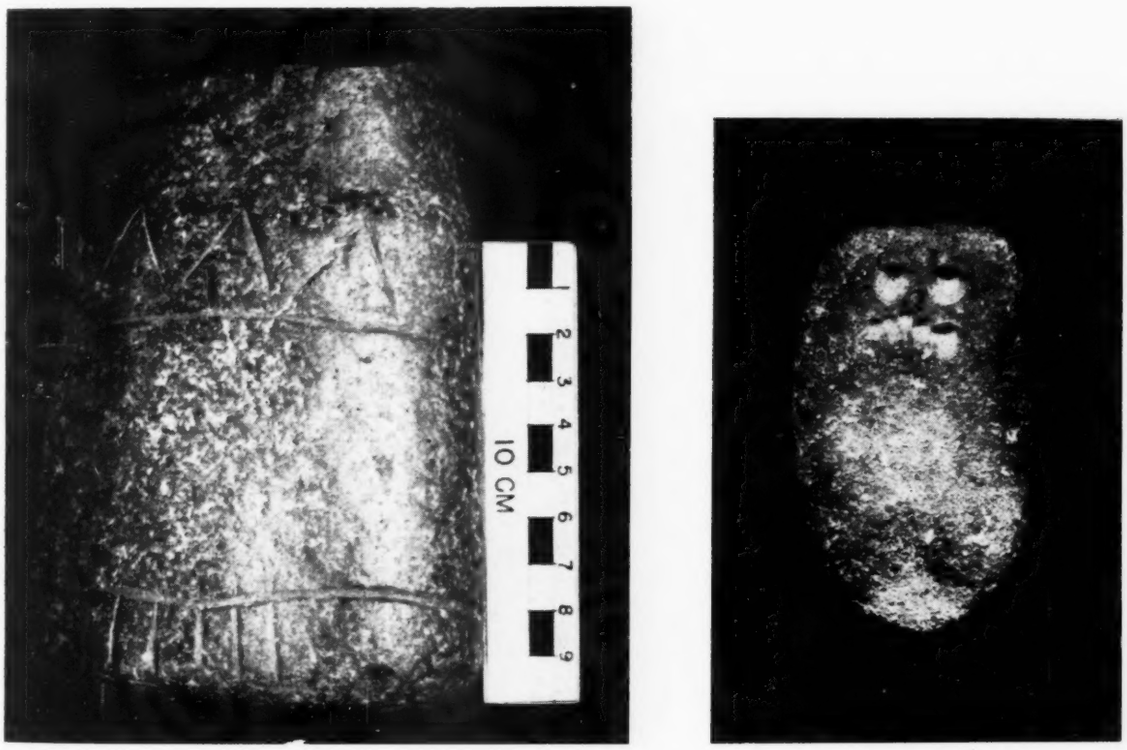


FIG. 69. Maul and "owl stone." (1) Maul from SR-I. (2) Owl Stone; length, 96 mm, width, 55 mm, thickness, 17 mm; surface find by Mr. Gerald Wolff.

FIG. 70. Skull 11–221. Front, side, and top views. Oriented in Frankfort position. *Cf.* Appendix C, table 17 for measurements.

FIG. 71. Skull 11–222. Front, side and top views. Oriented in Frankfort position. *Cf.* Appendix C, table 17 for measurements.

FIG. 72. Skull 11–236. Front, side, top, and base views. Oriented in Frankfort position. *Cf.* Appendix C, table 17 for measurements.

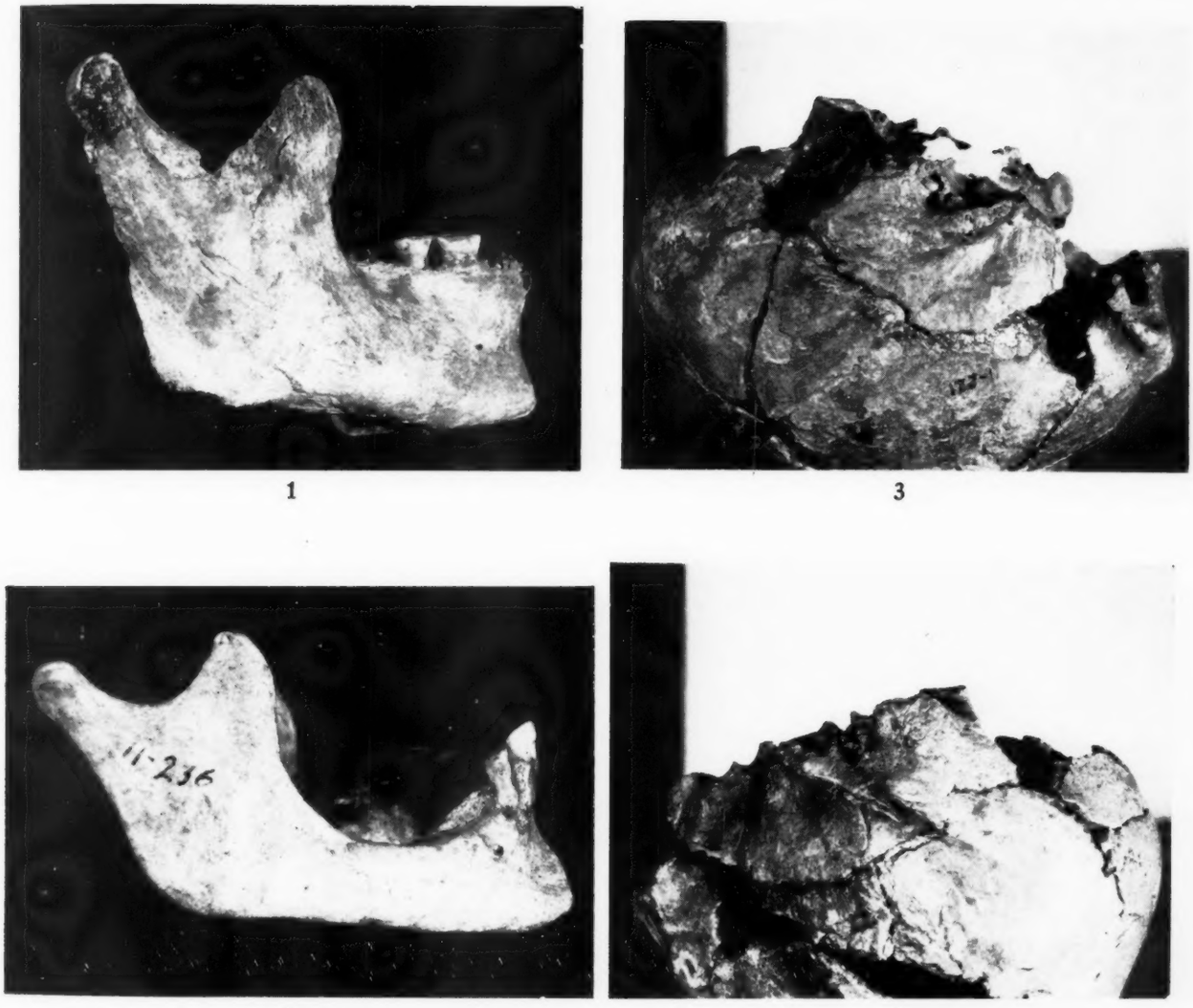


FIG. 73. Mandibles and auditory exostoses. (1) Mandible of 11–222, ♂. (2) Mandible of 11–236, ♀. (3) Exostosis of left external auditory meatus in 11–221. (4) Exostosis of right external auditory meatus in 11–221.

INDEX

Adolescents
  power quests of, 394, 395
  skeletons of, 458, 498
Agency Lake, 379 (note)
Altithermal temperature age, 378, 459 f., 463, 467
Ana Spring, 387
Anathermal temperature age, 378, 459 f.
Animals. *See also* Fauna
  bones by levels, Kawumkan Springs Midden, 449, 450, 451, 452, 453
  as food, 389, 448 ff.
Antevs, Ernst
  dating by, 378 f., 459 f.
  terminology of, 377 f.
Antler artifacts
  in Kawumkan Springs Midden, 427, 430 f., 432, 496
  in Long-I, 446, 502
  in Medicine Rock Cave, 401 f., 487
Arrow smoothers. *See* Smoothers
Arrow wrench (?), 428, 430
Artifacts, 384
  antler. *See* Antler artifacts
  bone. *See* Bone artifacts
  Great Basin and Klamath compared, 465 f., 470
  grooved, 429
  from house pits, 446 ff., 502 ff.
    inventory, 471 f.
  in Kawumkan Springs Midden, 410 ff., 491 ff.
    analysis, method of, 408 ff.
    distribution by levels, 426
    in habitation sites, 444
    in situ, 490
    summary, 432 f.
  in Medicine Rock Cave, 401 f., 487
  problematical objects, 429, 495
Atlatl points: in Medicine Rock Cave, 401, 487
Atlatl weights (?), 429, 495
  near burial, 457
Awls: from Kawumkan Springs Midden, 431, 432, 496

Bark
  floor covering of, 438, 441 f.
  as food, 389, 485
  fringed skirts of, 393, 466
Basalt
  Kawumkan Spring exposure, 405
  use of, 401, 433
Baskets, 393 f.
  Great Basin and Klamath compared, 466
Beads, 393
  in Kawumkan Springs Midden, 430, 432, 495, 496
Belts, 393
Benches, 440
  peat padding (Lalo-I), 447
Benham Falls projectile points, 417
Bibliography, 482 f.
Birds
  as food, 449 ff.
  from Kawumkan Springs Midden, identification of, 480 f.
Bison, 387, 460
Blankets, 393
Blitzen River, 387
  crania series, 479 f.
Bolas, 429
Bone artifacts
  in Kawumkan Springs Midden, 430 ff., 469, 490, 496
  in Medicine Rock Cave, 401 f., 487
Bonneville Lake, 378
Bow and arrow: appearance of, 416, 417
Burials
  dog. *See* Dog burials
  human, 444, 457 f., 497 ff.
    patterns of, 459
    in stone platform, 444, 498
Butte Creek Cave: cranium from, 479 f.

Camel, 382, 387, 460
Cannibalism (?), 459
Canoes, 390
Carnivores: as food, 449 ff.
Catlow twine, 466
Catlow Valley Caves
  site location, 380, 381
  skull from, 479 f.
Caves, 395, 468
Chalcedony: for drills, 419
Chama Valley: two-horned mano from, 462
Charm stones, 429
Chert
  for drills, 419
  knife of, 417 f., 492
Chevron design, 447, 504, 505
Chewaucan River, 387
Chiefs, 395
Chiloquin, 385, 484
Choppers
  as evidence of food habits, 454
  in Kawumkan Springs Midden, 427, 492, 469, 497
  in Long-I, 446, 502
Chronology
  dog burials in relation to, 455 f.
  of Great Basin cultures, 459 f., 463 ff., 470
  of houses, 469
  of Klamath area culture, 459 ff., 463 f., 469 f.
    absolute, 462 f.
    cross dating with cultural manifestations, 460 f.
    reference to geological features, 460
    referent cultural manifestations, 461 f.
  projectile points in relation to, 416 f., 461 f.
  of village sites, 445
Clallam-Indian dog, 472
Clothing. *See* Costume
Cochrane advance, 378 f.
Columbia River area
  Five Mile Rapids site, 448, 454 f.
  Klamath area chronology and, 460
  occupation of plateau, 398
  WS-4, location, 380, 381
Costume, 392 f.
Coyote skeleton, 455, 474
Cremation, 396
Culture. *See* Klamath culture
Cutting tools. *See* Knives; Scrapers

Dagger: from Kawumkan Springs Midden, 431, 432, 496
Dance, shaman's, 395
  fringed skirt in, 393, 466
Danger Cave, 379
  points, in cross dating, 462
  site location, 380
Dating. *See* Chronology
Dead: disposal of, 396
Decoration
  of baskets, 394
  chevron design, 447, 504, 505
  circle and dot, 430, 432, 496
Dentalia, 393
Deschutes River, 382
  artifacts, date of, 460
  projectile points, 417
Des Moines maximum, 378
Dog burials, 455 ff., 469
  location, in Kawumkan Springs Midden, 410
Dogs
  prehistoric, from Klamath Reservation, 472 ff.
  skeletons *in situ*, 497
Drills
  in Kawumkan Springs Midden, 419, 492
  in Long-I, 446, 502
  in Medicine Rock Cave, 402, 487

Earth lodge, 390 ff.
Ecology
  adaptation of Klamath Indians at time of white contact, 388, 397
  adaptation of midden population, 454 f., 468
  of Great Basin, 379, 454 f., 466
  of Klamath Lake area, 382, 454 f., 466
Elephant, 382
Elk, 587
Elk horn tools, 427, 496
Entrances, of houses, 441
Equus, 387, 460
Ethnographic house pattern, 440, 442, 445
Excavation methods, 382, 384
  Kawumkan Springs Midden, 405 f.
  Medicine Rock Cave, 398 ff.

False embroidery, 394, 466
Faults, geologic: in Klamath area, 385
Fauna
  of Great Basin, 379, 387
  of Klamath Lake area, 382, 386
Fish
  as food, 449 ff., 466, 467
  gathering, 388
  identification of bones, 481
  Kawumkan Spring channel, 405
  in Klamath Lake area, 382, 386

Fish ceremony, 402
Fish gorges
from Kawumkan Springs Midden, 431, 432, 496
in Long-I, 446, 502
from Medicine Rock Cave, 401 f., 487
Fishhooks
from Kawumkan Springs Midden, 431, 432, 496
in Long-I, 446, 502
Five Mile Rapids excavation, 448, 454 f.
Flakers
from Kawumkan Springs Midden, 431, 432, 496
in Long-I, 446, 502
Flakes
by kinds of stone, at Kawumkan Springs Midden, 411
in Medicine Rock Cave, 402, 487
scrapers compared, 418
Fleshers
in Kawumkan Springs Midden, 417, 431, 432, 496
in Long-I, 446, 502
Flora
of Great Basin, 379, 387
of Klamath Lake area, 386, 387
Food economy of midden population, 448 ff.
animals other than mussels, 449 ff.
artifacts as evidence, 453 f.
changes at Level II, 453
ecological adaptation, 454 f.
evidence, types of, 448
mussels, 448 f.
summary of food habits, 454
Food gathering activities, 388 ff.
Food habits
Great Basin and Klamath compared, 466
knives in relation to, 418
of midden population, 454
Food supply
of Great Basin, 379
of Klamath Lake area, 382, 386
Footgear, 392 f.
snowshoes, 393
wading shoes, 393
Forest: of Klamath Lake area, 386
Fort Rock, 382
Klamath area chronology and, 460, 463
sandals from, 460, 466
site location, 380, 381

Gambling trays, 394
Game animals: as food, 449 ff., 466
Gastropods: casts of, as beads, 430 (note), 495
Gentry house pits. *See under* Williamson River house pits
Gouges, 419
in Medicine Rock Cave, 402, 487
Gravers
in Kawumkan Springs Midden, 419, 492
in Medicine Rock Cave, 402, 487
Great Basin
archaeological sites, 379 ff.
chronology, 459 f., 463 ff., 470
climate, 378 f., 381
cultural picture, 379
Klamath culture compared, 465 ff., 470
ecology, 379, 454 f.
fauna, 379, 387
flora, 379, 387
Klamath habitat compared, 386 f.
location, 378
occupation by man, 378 f., 381
physiography, 378 ff.
projectile points, 451 ff., 465 f.
Grinding tools
common, 389
Great Basin and Klamath compared, 466
in Kawumkan Springs Midden, 419 ff., 492 ff.
combination, 425, 494
in Long-I, 446, 502
from Sprague River house pits, 447, 504
for *Wocas*, 388 f.

Hammerstones
grinding tool and, 425, 494
from Kawumkan Springs Midden, 428
Harpoons
from Kawumkan Springs Midden, 431, 432, 496
points, in Long-IV, 447, 503
Hats, 393
Head scratcher: from Medicine Rock Cave, 402, 487
Hotrocks, 425 ff., 490
in Long-I, 446, 502
House pit artifacts, 446 ff., 502 ff.
inventory, 471 f.
Houses
archaeological record, 433 ff., 469
bark floor covering, 438, 441 f.
benches, 440
burning after a death, 439
classes, by size, 435 f.
construction method, 442
entrances, 441
floor shape, 440
ideal pattern, 435
plans, 436 ff.
postholes, 437 ff.
re-use, 439, 441
roof supports, 438 f.
size and shape, 435 ff.
sweat houses, 442
burning of, 469
chronology, 469
in contact period, 390 ff.
burning after a death, 396
earth lodge, 390 ff.
shaman's, 395
summer, 392
sweat, 392
distribution of, 433 ff.
ethnographic pattern, 442, 445
of floor shape, 440
excavation sites, 433
sweat, 392, 442
Human skeletal remains, 457 ff., 469, 506 ff.
burials, 444, 457 f., 497 ff.
distribution, 459
in situ, 497 ff.
in Kawumkan Springs Midden, 457 ff., 475 ff., 497 ff.
location, 409, 410
in Medicine Rock Cave, 401, 486
in stone platform, 444, 498
Hunting, 389

Kawumkan Springs, 405, 484
Kawumkan Springs Midden, 403 ff., 488 ff.
artifacts, 410 ff., 491 ff.
analysis of, 408 ff.
antler, 430 f., 432, 496
bone, 430 ff., 496
distribution by levels, 426
in habitation sites, 444
in situ, 490
problematical objects, 429, 495
summary, 432 f.
beads, 430, 432, 495, 496
choppers, 427, 492
chronology, 463, 465
dog burials, 455
location, 410
dog remains, 473 f., 475
in situ, 497
drills, 419, 492
excavation methods, 384, 405 f., 468
external influences, Level III, 433
fire broken stones, by levels, 411
flesher, 417
food habits. *See* Food economy of midden population
formation, 404 f.
gravers, 419, 492
grinding tools, 419 ff., 492 ff.
combination, 425, 494
habitation sites, 443 ff.
hammerstones, 428
history, 405
hotrocks from, 425, 490
human skeletal remains, 457 ff., 475 ff., 497 ff.
identification of bird and fish bones from, 480 f.
knives, 417 f., 492
levels, use in presenting results, 406 ff.
manos, 423, 494
mauls, 428 f., 497
metates, 423, 493
mortar-pestles, 423 ff., 492
paint pallettes, 419, 425, 493
pendants, 430, 495
profiles, 403, 404
projectile points, 410 ff., 491
changes in, significance, 416 f.
classification method, 411, 414
distribution, 412 ff.
Great Basin types compared, 415
types, 414 ff.
workmanship, 411
scrapers, 418 f.
site location, 383
site map, 403
skeletal material, location, 409, 410
stone platforms, 444
test pit profiles, 407
wedges, 427, 428, 492
workmanship, 411, 419, 433

Kawumkan Springs Midden (Long-Lalo) house pits, 433 ff., 488
artifacts, 446 f., 502 ff.
bark floor covering, 438, 441
benches, 440
chronology, 445, 463, 469
depth, 435
dog burial, 455
excavation methods, 382, 384
human skeletal remains, 457
measurements, 436
plans, 436 ff.
postholes, 437 f.
re-use, 441
Kemŭ'kŭmps, 395
Medicine Rock Cave tradition, 398
myth, burial request, 396
Kitchens, 408, 431, 456, 469, 498
burial into, 458 f., 498
Klamath culture
changes at Level II, 416
chronology. *See under* Chronology
geographical relationships, 467
Great Basin culture in relation to, 465 ff., 470
precontact (immediate), 387 ff.
basketry, 393 f.
canoes, 390
contacts and sources of change, 396, 397
costume, 392 f.
dead, disposal of, 396
ecological adaptation, 388, 397
food gathering activities, 388 ff.
house types, 390 ff.
language, 396 f.
Northwest Coast influence, 395
religion, 394 ff.
sacred objects and places, 395
seasonal movements, 389 f.
shamans, 395
summary, 397 f.
prehistoric position, 382
reception of new ways, 467
specialization, 466 f., 468, 470
Klamath habitat, 384 ff., 484
Klamath-Indian dog, 472
Klamath Indian Reservation, 384 f.
site locations, 382, 383
Klamath Indians
environmental background, 378 ff.
habitat, 384 ff., 484
prehistoric culture position, 382
settlements, 385
treaty with, 382 (note), 463
Klamath Lake, 379
Klamath Lake, Lower
bone projectile point from, 417, 431 f. 444, 456, 469, 496
Klamath area chronology and, 460, 461
site location, 380, 381
Klamath Lake, Upper, 379 (note)
Klamath Lake area
choice as site, 381 f., 468
ecology, 382, 454 f.
environmental background, 378 ff.
fauna, 382, 386
flora, 386, 387
food supply, 382, 386
Great Basin compared with, 386 f.
Great Basin in relation to, 382
land use, 384 f.
settlements, 385
site location, 380, 381
topographic features, 385 f.
vegetation, 386
Klamath Marsh, 484
village sites, 385, 389, 443
KL-9-11 house pits. *See under* McReady Ranch house pits.
KL-12 house pit, 500
profile, 445
size and depth, 436, 437
Knives
in midden, 417 f., 492
bone, 431, 432, 490, 496
in Long-I, 446, 502
in Medicine Rock Cave, 402, 487
Kodiak Island small dog, 455, 456 f., 473 ff.

Lacustrine deposits: Klamath area, 385
Ladders, 441
Lahontan, Lake, 378
Lalo, Roland, 435
Lalo family, 405, 434 f.
Lalo Ranch: village site, 434 f.
Lalo Spring, 405
Land use: in Klamath area, 384 f.
Language, 396 f.
Leggings, 393
Leonard Rock shelter, 379, 380
Lind Coulee: site location, 380
Long family, 405
Long-Lalo house pits. *See* Kawumkan Springs Midden (Long-Lalo) house pits
Long Ranch: village site, 434 f.
Lovelock, Nev., 379, 380
artifacts, in cross dating, 462
site location, 380

McQuiston house pits. *See under* Williamson River house pits
McReady Ranch house pits, 433, 435
chronology, 445
KL-9, 499
as approximation of ethnographic pattern, 442
construction, 442, 443
contours and profiles, 442
date, 463
"planks," 443, 485
postholes, 438
size and depth, 435, 436 f.
KL-10, 499
KL-11, 484, 500
bench, 440
measurements, 436
profiles, 442, 444, 445
Malheur Lake, 387
crania from, 479 f.
Mammoth, 460
Mankato-Valders retreat, 378 f.
Mano-metate complex, 419 ff. *See also* Manos; Metates
as evidence of food habits, 453 f.
mortar-pestle vs., 420 ff.
Manos. *See also* Mano-metate complex
bell-shaped, 422, 446, 494
variation, 447, 504
development in Klamath Lake area, 421, 448, 466
Great Basin type, 420
grooved, 446, 502
from Sprague River house pits, 447, 504
hemispherical, 446, 447, 502
from Sprague River house pits, 447, 504
in Kawumkan Springs Midden, 423, 494
from Long-II, 446 f., 502
from Sprague River house pits, 447, 504
two-horned, 388 f., 419 f., 448
early form, 446, 502
from Gentry-I, 447, 494
minimum date, 462
from Sprague River house pits, 447, 504
types, 422
variants, 423
Mats, 394
in earth lodge construction, 391
in summer house construction, 392
in sweat house construction, 392
Mauls, 389, 427, 505
from Kawumkan Springs Midden, 428 f., 497
from Sprague River house pits, 447, 504, 505
Mazama, Mount: eruption date, 379, 400, 462, 464 (note)
Medicine Rock Cave, 398 ff., 486
artifacts, 401 f., 487
wedge, 427
chronology, 462
dog burials, 455
dog remains, 474, 475
excavation, 382, 384, 398 ff.
geological stratigraphy, 398 ff.
human skeletal remains, 401, 486
levels, 400
occupation, 400 f., 402, 465
plan, 399
sacred rock, 395
site location, 383
skeletal material, 401
structure, 398
summary, 402 f.
Medithermal temperature age, 378, 459 f., 463, 467
Merritt house pits. *See under* Williamson River house pits
Metates, 389. *See also* Mano-metate complex
Great Basin type, 420
in Kawumken Springs Midden, 423, 493
in Medicine Rock Cave, 401, 487
for *Wocas*, 388 f.
Midden. *See* Kawumkan Springs Midden
Moccasins, 392 f.
Modoc Indians: contact with Klamath, 467
Monteau, Glenn, 434 f.
Mortar-pestle complex, 389, 419, 420 ff. *See also* Mortars; Pestles
as evidence of food habits, 454
mano-metate vs., 420 ff.
Mortars. *See also* Mortar-pestle complex
in Kawumkan Springs Midden, 423 ff.
Muller. *See* Mano
Mussels, 387
as food, 448 f.

shell concentration, Kawumkan Springs Midden, 410
shell pendants, 430, 495
shells, in Medicine Rock Cave, 401

Needles
from Kawumkan Springs Midden, 431, 432, 496
from Medicine Rock Cave, 402, 487
Neothermal age, 459 f.
climatic changes of, 378 f.
definitions, 377 f.
Northwest Coast Shell Heap dog, 455, 456 f., 473 ff.

Obsidian
for projectile points, 401
use in Kawumkan Springs Midden artifacts, 433
Occupation by man
of Columbia Plateau, 398
of Great Basin, 378 f., 381
of Kawumkan Springs Midden, 463, 468
of Medicine Rock Cave, 400 f., 402
Odell Lake
Klamath area chronology and, 460, 461
projectile points, 417
site location, 380, 381
Oregon
archaeological sites, 381
south central, crania from, 478 ff.
Owl stone, 505

Paint pallettes: in Kawumkan Springs Midden, 419, 493
Paisley Caves, 387
in Klamath area chronology, 463
site location, 380, 381
Paiute Indians
crania series, 478 ff.
hotrocks from territory, 427
Klamath attitude toward, 467
Pallettes. *See* Paint pallettes
Pecos: two-horned mano, 462
Pendants
in Kawumkan Springs Midden, 430, 495
from Medicine Rock Cave, 402, 487
Pestles. *See also* Mortar-pestle complex
in Kawumkan Springs Midden, 423 ff., 492, 495
Pine: as food source, 389, 485
Plummets, 429
Pluvial lakes, 378
Polishers. *See* Smoothers
Postglacial: definition, 377
Postholes, 437 ff.
Post-Pleistocene geochronology: terminology, 377 f.
Power quest, 394 ff.
cairn, 485
Projectile points
bone, bevelled, 417, 431 f., 444, 456, 469, 496, 498
in cross dating, 456, 461 f.
Great Basin types, 415 ff., 465 f.
in Kawumkan Springs Midden, 410 ff., 491
Klamath and Great Basin, compared, 416 f.
leaf-shaped, 417, 468
in Medicine Rock Cave, 401, 487
side-notched, 417, 456
summary, 467, 469 f.
Pumice layer: of Medicine Rock Cave, 400, 468
Pyramid Lake, 378

Religion, 394 ff.
Rocks. *See also* Hotrocks; Stones
sacred, 395
Rodents
as food, 449 ff., 466
holes of, 489

Sacred objects and places, 395
Sahaptins, 396
Sandals, 392 f.
from Port Rock Cave, 460, 466
Scrapers
as evidence of food habits, 453
Great Basin and Klamath compared, 466
in Kawumkan Springs Midden, 418 f., 432, 469
in Medicine Rock Cave, 402, 487
Seasonal movements: in Klamath area, 389
Sewing, of mats, 392
Shamans, 395
dance, 395
fringed skirt in, 393, 466
power quest, 394
Shells. *See* Mussels
Shoes. *See* Footgear
Shoshonean projectile points: Klamath area chronology and, 461 f., 465 f.
Siberian dog, 455, 456 f., 473 ff.
Sites, archaeological
in Great Basin, 380
in Oregon, 381
Skirt, fringed, 393, 466
Slaves, 395
Smoothers (polishers), 430
from Lalo-II, 447, 504
from Long-I, 446, 502
Snowshoes, 393
Spall scrapers: in Kawumkan Springs Midden, 432, 466
Sprague River, 484
freezing of, 389 f.
settlements, 385, 389
Sprague River house pits, 433, 435, 447, 469, 484, 501
artifacts, 447, 504
bark floor covering, 441 f.
benches, 440
construction, 442
date of, 445
entrance, 441
excavation site, 382, 383
floor shape, 440
measurements, 436
plans, 439 f.
postholes, 437
Springs: in Great Basin, 387
Steens Mountain springs, 387
Stone platforms, 444. *See also* Kitchens
Stones
fire broken, Kawumkan Springs Midden, 411
heating. *See* Hotrocks
kinds, used as flakes, Kawumkan Springs Midden, 411
power quest and, 394 f., 485
Summer house, 392
Summer Lake: Klamath area chronology and, 382, 460
Sweat houses, 392, 442

Temperature ages, postglacial: terminology, 377 f.
Topography: of Klamath area, 385
Trays, 394
Treaty with Klamath Indians, 382 (note), 463
Tule, 397

Villages
chronology, 463, 465
location, 385, 389
Violence, deaths by, 459
Volcanism: in Klamath area, 385

Warm Springs Indians, 467
Warner Valley: hotrocks from, 427
Washington State: Klamath area chronology and site in, 460
Waterfowl
as food, 449 ff., 466
gathering, 388
identification of bones, 480 f.
Wealth, 395
Wedges, 427, 428, 492
antler, 430, 432, 496
Wikiup: site location, 380, 381
Willamette Valley
Klamath area chronology and, 460
site location, 380, 381
Williamson River, 484
settlements, 385, 389
Williamson River house pits, 433, 435, 469, 484
artifacts, 447, 505
excavation site, 382, 383
Gentry, 383
bench, 440
date of, 445
dog burial, 455
dog remains, 474
plans, 440
sweat house, 442
McQuiston, 383
plan, 441
measurements, 436
Merritt, 501
location, 383
plan, 441
Wocas, 386, 467
canoe for gathering, 390
gathering, 388
grinding tools for, 388, 466
Long-I tools for, 446
Wolf mandible, 457 f., 474
Workmanship
at Kawumkan Springs Midden, 411, 419, 433
of projectile points, 411
Wrench, arrow, 428, 430
WS-4, Columbia River, 448
site location, 380, 381